April 2017 Report 1067

Characteristics of minimum wage workers, 2016

In 2016, 79.9 million workers age 16 and older in the United States were paid at hourly rates, representing 58.7 percent of all wage and salary workers. Among those paid by the hour, 701,000 workers earned exactly the prevailing federal minimum wage of $7.25 per hour. About 1.5 million had wages below the federal minimum. Together, these 2.2 million workers with wages at or below the federal minimum made up 2.7 percent of all hourly paid workers.

The percentage of hourly paid workers earning the prevailing federal minimum wage or less declined from 3.3 percent in 2015 to 2.7 percent in 2016. This remains well below the percentage of 13.4 recorded in 1979, when data were first collected on a regular basis. (See table 10.)

This report presents highlights and statistical tables describing workers who earned at or below the federal minimum wage in 2016. The data are obtained from the Current Population Survey (CPS), a national monthly survey of approximately 60,000 households conducted by the U.S. Census Bureau for the U.S. Bureau of Labor Statistics (BLS). Information on earnings is collected from one-fourth of the CPS sample each month.

The CPS does not include questions on whether workers are covered by the minimum wage provisions of the federal Fair Labor Standards Act (FLSA) or by individual state or local minimum wage laws. The estimates of workers paid at or below the federal minimum wage are based solely on the hourly wage they report, which does not include overtime pay, tips, or commissions. See the accompanying technical notes section for more information, including a description of the source of the data and an explanation of the concepts and definitions used in this report.

Highlights

The following are highlights from the 2016 data:

Age. Minimum wage workers tend to be young. Although workers under age 25 represented only about one-fifth of hourly paid workers, they made up about half of those paid the federal minimum wage or less. Among employed teenagers (ages 16 to 19) paid by the hour, about 10 percent earned the minimum wage or less, compared with about 2 percent of workers age 25 and older. (See tables 1 and 7.)

Gender. Among workers who were paid hourly rates in 2016, about 3 percent of women and about 2 percent of men had wages at or below the prevailing federal minimum. (See table 1.)

Race and Hispanic or Latino ethnicity. The percentage of hourly paid workers with wages at or below the federal minimum differed little among the major race and ethnicity groups. About 3 percent of White and Black workers earned the federal minimum wage or less. Among Asian and Hispanic workers, the percentage was about 2 percent. (See table 1.)

Education. Among hourly paid workers age 16 and older, about 5 percent of those without a high school diploma earned the federal minimum wage or less, compared with about 3 percent of those who had a high school diploma (with no college), 3 percent of those with some college or an associate degree, and about 2 percent of college graduates. (See table 6.)

Marital status. Of those paid an hourly wage, never-married workers, who tend to be young, were more likely (5 percent) than married workers (1 percent) to earn the federal minimum wage or less. (See table 8.)

Full- and part-time status. About 6 percent of part-time workers (persons who usually work fewer than 35 hours per week) were paid the federal minimum wage or less, compared with about 2 percent of full-time workers. (See table 1.)

Occupation. Among major occupational groups, the highest percentage of hourly paid workers earning at or below the federal minimum wage was in service occupations, at about 7 percent. Two-thirds of workers earning the minimum wage or less in 2016 were employed in service occupations, mostly in food preparation and serving related jobs. (See table 4.)

Industry. The industry with the highest percentage of workers earning hourly wages at or below the federal minimum wage was leisure and hospitality (about 13 percent). Three-fifths of all workers paid at or below the federal minimum wage were employed in this industry, almost entirely in restaurants and other food services. For many of these workers, tips may supplement the hourly wages received. (See table 4.)

State of residence. The states with the highest percentages of hourly paid workers earning at or below the federal minimum wage were Idaho, Kentucky, Louisiana, Mississippi, and South Carolina (all were at or about 5 percent). The states with the lowest percentages of hourly paid workers earning at or below the federal minimum wage were in the West: Alaska, California, and Oregon (all were 1 percent or less). It should be noted that many states have minimum wage laws establishing standards that exceed the federal minimum wage. (See tables 2 and 3.)

Statistical Tables

[+] Table 1. Wage and salary workers paid hourly rates with earnings at or below the prevailing federal minimum wage, by selected characteristics, 2016 annual averages

[+] Table 2. Wage and salary workers paid hourly rates with earnings at or below the prevailing federal minimum wage, by census region and division, 2016 annual averages

[+] Table 3. Wage and salary workers paid hourly rates with earnings at or below the prevailing federal minimum wage, by state, 2016 annual averages

[+] Table 4. Wage and salary workers paid hourly rates with earnings at or below the prevailing federal minimum wage, by occupation, 2016 annual averages

[+] Table 5. Wage and salary workers paid hourly rates with earnings at or below the prevailing federal minimum wage, by industry, 2016 annual averages

[+] Table 6. Wage and salary workers paid hourly rates with earnings at or below the prevailing federal minimum wage, by educational attainment, 2016 annual averages

[+] Table 7. Wage and salary workers paid hourly rates with earnings at or below the prevailing federal minimum wage, by age and gender, 2016 annual averages

[+] Table 8. Wage and salary workers paid hourly rates with earnings at or below the prevailing federal minimum wage, by marital status, age, and gender, 2016 annual averages

[+] Table 9. Wage and salary workers paid hourly rates with earnings at or below the prevailing federal minimum wage, by usual hours worked per week on primary job, 2016 annual averages

[+] Table 10. Wage and salary workers paid hourly rates with earnings at or below prevailing federal minimum wage, by gender, 1979–2016 annual averages (numbers in thousands)

Technical Notes

The estimates in this report were obtained from the Current Population Survey (CPS), which provides information on the labor force, employment, and unemployment. The survey is conducted monthly for the U.S. Bureau of Labor Statistics (BLS) by the U.S. Census Bureau using a scientifically selected national sample of about 60,000 eligible households in all 50 states and the

District of Columbia. The survey also provides data on earnings, which are based on one-fourth of the CPS monthly sample and are limited to wage and salary workers. All self-employed workers, both incorporated and unincorporated, are excluded from these earnings estimates.

Concepts and definitions

The principal definitions used in connection with the estimates of minimum wage workers presented in this report are described briefly below.

Wage and salary workers. These are those age 16 and older who receive wages, salaries, commissions, tips, payments in kind, or piece rates on their sole or principal job. This group includes employees in both the private and public sectors. All self-employed workers are excluded whether or not their businesses are incorporated.

Workers paid by the hour. These are wage and salary workers who report that they are paid at an hourly rate on their job. Historically, workers paid an hourly wage have made up approximately three-fifths of all wage and salary workers. Estimates of workers paid by the hour include both full- and part-time workers unless otherwise specified.

Hourly earnings. Data are for wage and salary workers who are paid by the hour and refer to a person's sole or principal job. Hourly earnings for hourly paid workers do not include overtime pay, commissions, or tips received.

Workers paid at or below the prevailing federal minimum wage. The estimates of the numbers of workers with reported earnings at or below the federal minimum wage pertain only to workers who are paid hourly rates. Salaried workers and the other nonhourly paid workers are excluded.

Regular collection of earnings data in the basic CPS began in 1979. The prevailing federal minimum wage for 1979 and later years is listed below:

Federal minimum wage	Effective date
$2.90	January 1, 1979
$3.10	January 1, 1980
$3.35	January 1, 1981
$3.80	April 1, 1990
$4.25	April 1, 1991
$4.75	October 1, 1996
$5.15	September 1, 1997
$5.85	July 24, 2007
$6.55	July 24, 2008
$7.25	July 24, 2009

Estimates of the annual average number of minimum wage workers for years when the minimum wage increased reflect both minimum wage levels in effect during the year. For example, data for 2007 reflect the number of workers at or below the federal minimum of $5.15 for January to July and $5.85 for August to December.

Full-time workers. People who usually work 35 hours or more per week at their sole or principal job are defined as working full time.

Part-time workers. People who usually work fewer than 35 hours per week at their sole or principal job are defined as working part time.

Race. In the survey process, race is determined by the household respondent. In accordance with the Office of Management and Budget guidelines, White, Black or African American, Asian, American Indian or Alaska Native, and Native Hawaiian or Other Pacific Islander are terms used to describe a person's race. The latter two race groups and people who selected more than one race are included in totals but not separately identified in this report because the number of survey respondents is too small to develop estimates of sufficient quality.

Hispanic or Latino ethnicity. These are people who identified themselves in the survey process as being of Hispanic, Latino, or Spanish origin. People whose ethnicity is identified as Hispanic or Latino may be of any race.

Interpreting minimum wage data

The CPS does not determine whether workers are covered by the minimum wage provisions of the federal Fair Labor Standards Act (FLSA) or by individual state or local minimum wage laws. The estimates of workers paid at or below the federal minimum wage are based solely on the hourly wage respondents report (which does not include overtime pay, tips, or commissions). It should be noted that some respondents might round hourly earnings when answering survey questions. As a result, some workers might be reported as having hourly earnings above or below the federal minimum wage when, in fact, they earn the minimum wage.

Some workers reported as earning at or below the prevailing federal minimum wage may not, in fact, be covered by federal or state minimum wage laws because of exclusions and exemptions in the statutes. Thus, the presence of workers with hourly earnings below the federal minimum wage does not necessarily indicate violations of the FLSA or state statutes in cases where such standards apply.

Estimates of the number of minimum wage workers in this report pertain only to workers who are paid hourly rates. Salaried workers and other workers who are not paid by the hour are excluded, even though some have earnings that, if converted to hourly rates, would be at or below the federal minimum wage. Consequently, the estimates presented in this report likely underestimate the actual number of workers with hourly earnings at or below the minimum wage. BLS does not routinely estimate the hourly earnings of workers not paid by the hour because of data-quality concerns associated with constructing such an estimate.

A number of states have established minimum wage rates that exceed the federal level. (Information on state minimum wage laws is available at www.dol.gov/whd/minwage/america.htm.) Users should be cautious about comparing state estimates in this report because of differing statutory minimum wages. It also should be noted that the CPS sample is based on residence; workers report their earnings on their job, which may or may not be located in the same state in which they live. In addition, the degree of sampling error may be quite large for some state estimates.

Reliability

Statistics based on the CPS are subject to both sampling and nonsampling error. When a sample, rather than the entire population, is surveyed, there is a chance that the sample estimates may differ from the true population values they represent. The component of this difference that occurs because samples differ by chance is known as sampling error, and its variability is measured by the standard error of the estimate. There is about a 90-percent chance, or level of confidence, that an estimate based on a sample will differ by no more than 1.6 standard errors from the true population value because of sampling error. BLS analyses are generally conducted at the 90-percent level of confidence.

The CPS data also are affected by nonsampling error. Nonsampling error can occur for many reasons, including the failure to sample a segment of the population, inability to obtain information for all respondents in the sample, inability or unwillingness of respondents to provide correct information, and errors made in the collection or processing of the data. For example, respondents may round their hourly earnings to whole dollars when answering survey questions.

Information about the reliability of data from the CPS is available on the BLS website at www.bls.gov/cps/documentation.htm#reliability.

Occupational Employment Statistics

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Occupational Employment and Wages, May 2016

53-7064 Packers and Packagers, Hand

Pack or package by hand a wide variety of products and materials.

National estimates for this occupation
Industry profile for this occupation
Geographic profile for this occupation

National estimates for this occupation: Top

Employment estimate and mean wage estimates for this occupation:

Employment (1)	Employment RSE (3)	Mean hourly wage	Mean annual wage (2)	Wage RSE (3)
705,660	1.6 %	$11.74	$24,430	0.4 %

Percentile wage estimates for this occupation:

Percentile	10%	25%	50% (Median)	75%	90%
Hourly Wage	$8.56	$9.29	$10.64	$13.27	$17.02
Annual Wage (2)	$17,810	$19,310	$22,130	$27,600	$35,410

Industry profile for this occupation: Top

Industries with the highest published employment and wages for this occupation are provided. For a list of all industries with employment in this occupation, see the Create Customized Tables function.

Industries with the highest levels of employment in this occupation:

Industry	Employment (1)	Percent of industry employment	Hourly mean wage	Annual mean wage (2)
Employment Services	146,070	4.04	$10.71	$22,290
Grocery Stores	138,280	5.14	$10.05	$20,910
Warehousing and Storage	66,170	7.28	$13.65	$28,390
Other General Merchandise Stores	29,170	1.53	$14.17	$29,470
Grocery and Related Product Merchant Wholesalers	26,390	3.55	$12.20	$25,380

Industries with the highest concentration of employment in this occupation:

Industry	Employment (1)	Percent of industry employment	Hourly mean wage	Annual mean wage (2)
Other Support Activities for Transportation	7,450	23.99	$12.08	$25,130
Warehousing and Storage	66,170	7.28	$13.65	$28,390
Sugar and Confectionery Product Manufacturing	4,880	6.64	$12.22	$25,420
Seafood Product Preparation and Packaging	1,810	5.58	$11.61	$24,150
Other Food Manufacturing	11,240	5.48	$13.38	$27,830

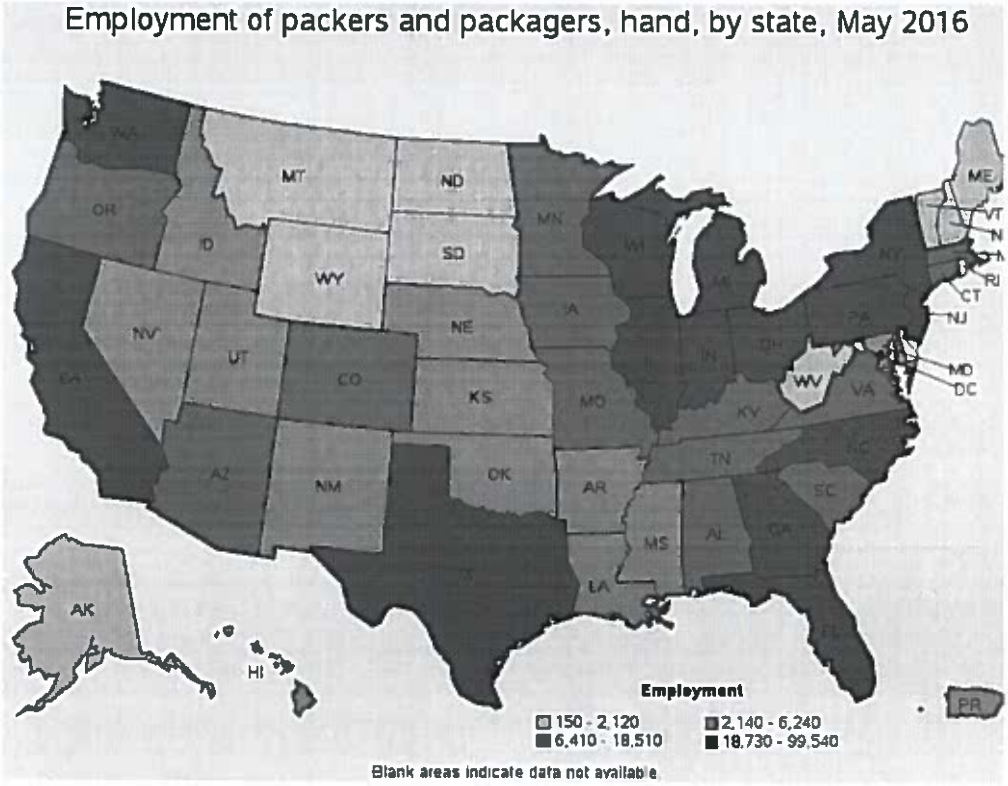
Top paying industries for this occupation:

Industry	Employment (1)	Percent of industry employment	Hourly mean wage	Annual mean wage (2)
Federal Executive Branch (OES Designation)	600	0.03	$22.22	$46,220
Aerospace Product and Parts Manufacturing	560	0.11	$18.73	$38,960
Home Furnishings Stores	150	0.06	$17.26	$35,890
	7,700	2.33	$16.30	$33,900

Motor Vehicle and Motor Vehicle Parts and Supplies Merchant Wholesalers				
Electrical Equipment Manufacturing	240	0.17	$16.04	$33,370

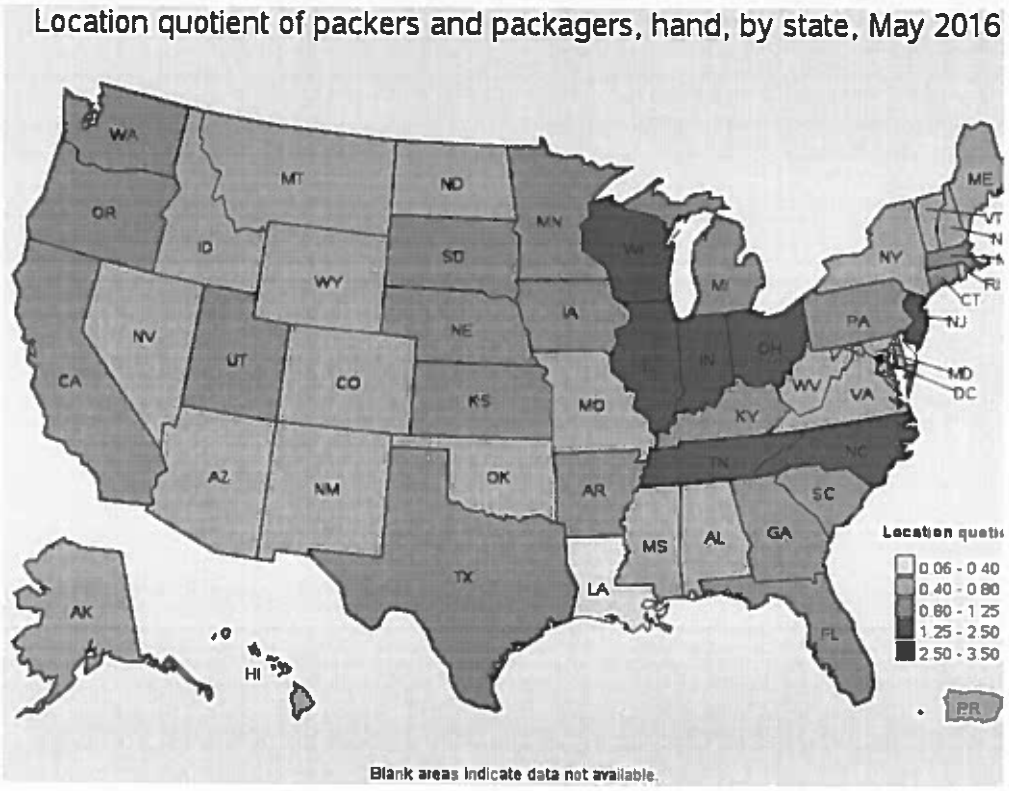
Geographic profile for this occupation: Top

States and areas with the highest published employment, location quotients, and wages for this occupation are provided. For a list of all areas with employment in this occupation, see the Create Customized Tables function.



States with the highest employment level in this occupation:

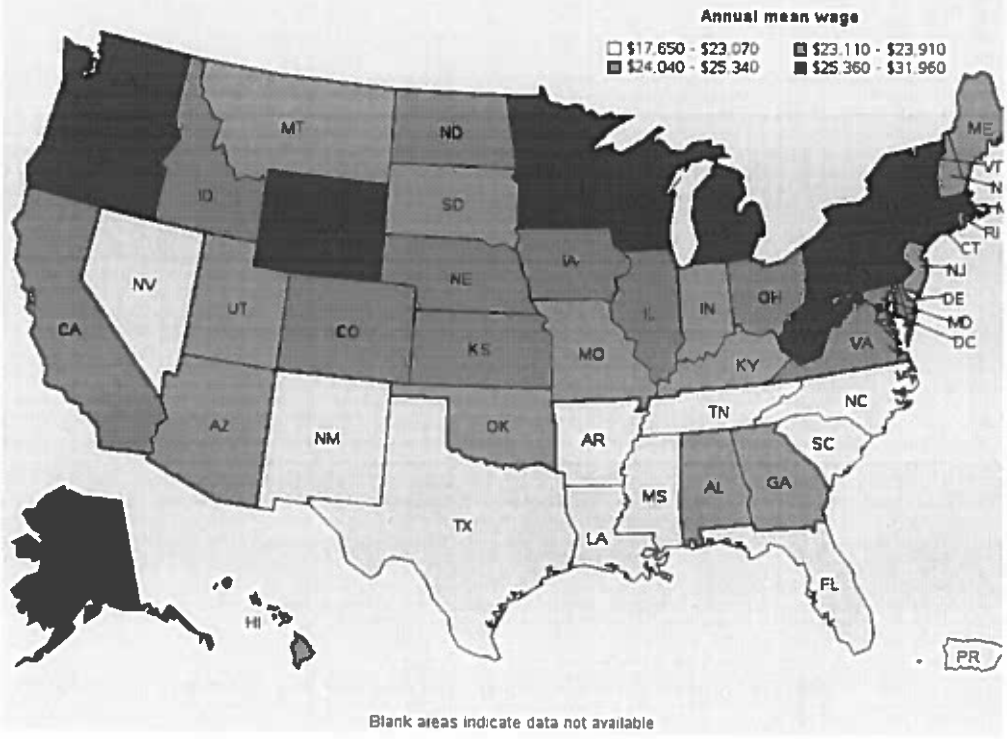
State	Employment (1)	Employment per thousand jobs	Location quotient (9)	Hourly mean wage	Annual mean wage (2)
California	99,540	6.23	1.24	$12.16	$25,290
Illinois	51,330	8.69	1.73	$11.91	$24,760
Texas	49,080	4.18	0.83	$11.05	$22,990
Ohio	40,960	7.67	1.53	$11.66	$24,250
Florida	37,120	4.51	0.90	$10.48	$21,790



States with the highest concentration of jobs and location quotients in this occupation

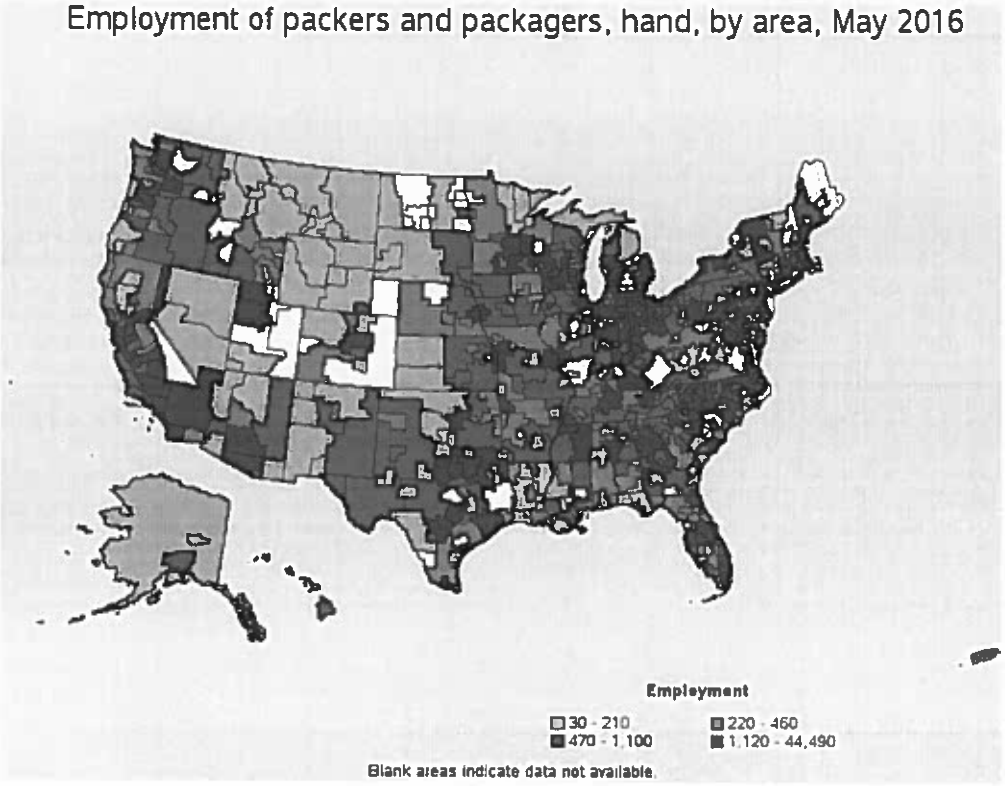
State	Employment (1)	Employment per thousand jobs	Location quotient (9)	Hourly mean wage	Annual mean wage (2)
Illinois	51,330	8.69	1.73	$11.91	$24,760
New Jersey	31,220	7.89	1.57	$11.15	$23,200
Ohio	40,960	7.67	1.53	$11.66	$24,250
Indiana	22,490	7.52	1.50	$11.31	$23,520
Wisconsin	19,670	7.01	1.40	$12.99	$27,010

Annual mean wage of packers and packagers, hand, by state, May 201(



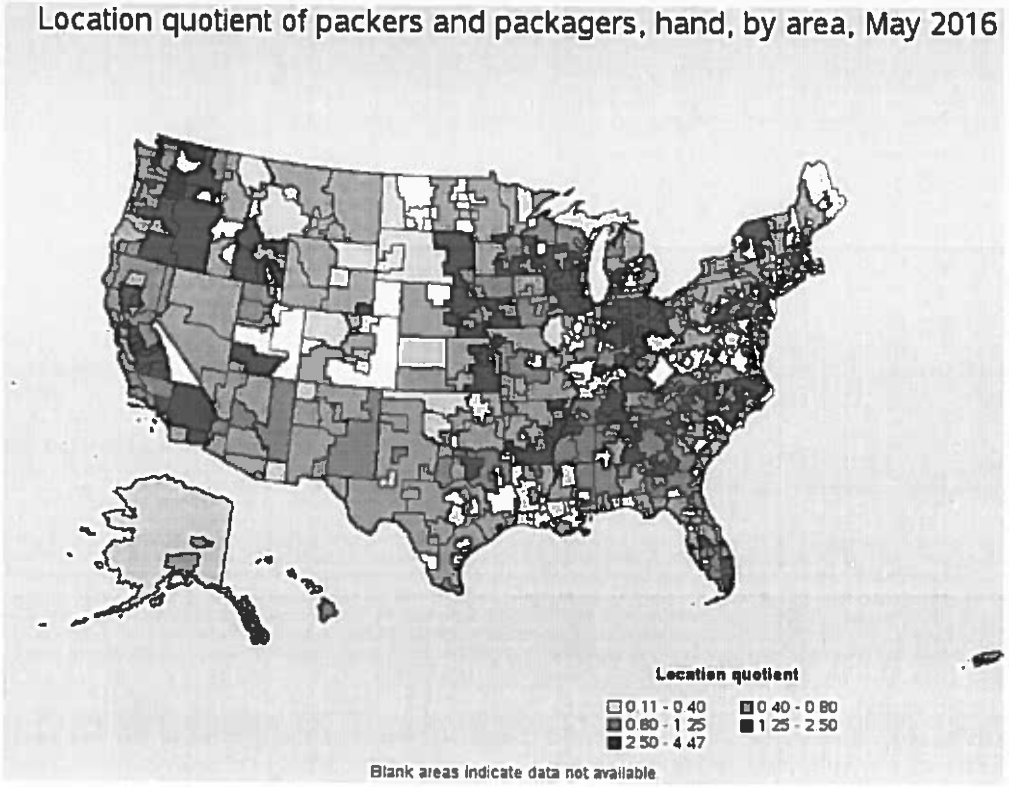
Top paying States for this occupation:

State	Employment (1)	Employment per thousand jobs	Location quotient (9)	Hourly mean wage	Annual mean wage (2)
Alaska	910	2.81	0.56	$15.37	$31,960
Connecticut	7,270	4.37	0.87	$14.53	$30,220
District of Columbia	220	0.31	0.06	$13.74	$28,590
Wyoming	1,020	3.71	0.74	$13.48	$28,050
Washington	18,730	6.11	1.22	$13.20	$27,450



Metropolitan areas with the highest employment level in this occupation

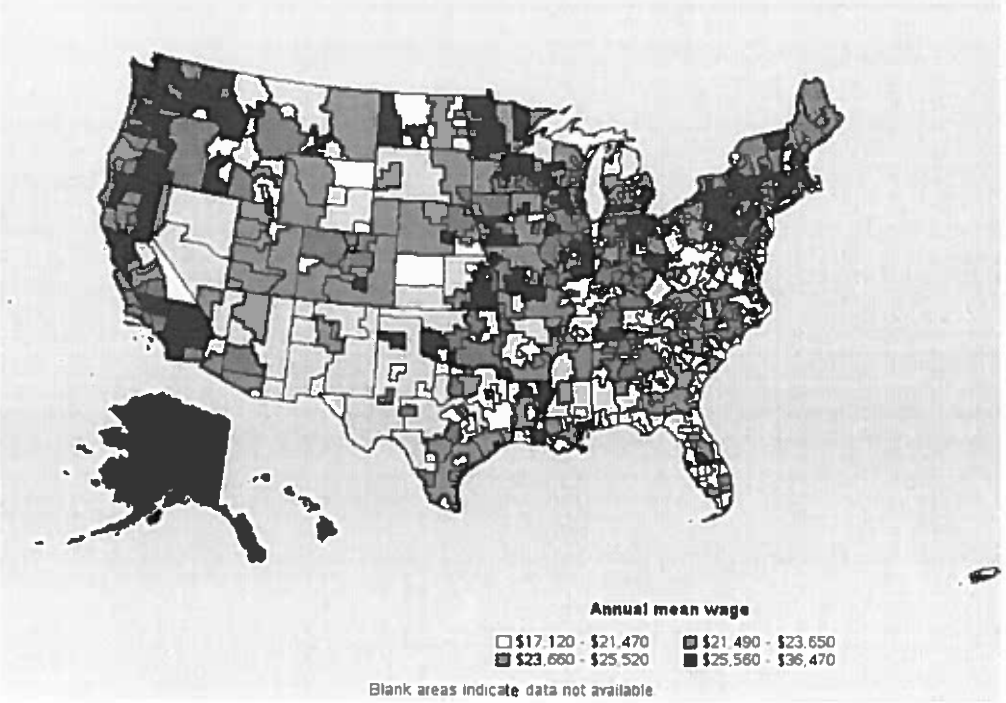
Metropolitan area	Employment (1)	Employment per thousand jobs	Location quotient (9)	Hourly mean wage	Annual mean wage (2)
Chicago-Naperville-Arlington Heights, IL Metropolitan Division	32,850	9.03	1.80	$11.46	$23,830
Los Angeles-Long Beach-Glendale, CA Metropolitan Division	32,590	7.72	1.54	$11.37	$23,660
New York-Jersey City-White Plains, NY-NJ Metropolitan Division	28,450	4.32	0.86	$11.36	$23,620
Dallas-Plano-Irving, TX Metropolitan Division	16,990	6.99	1.39	$11.04	$22,960
Atlanta-Sandy Springs-Roswell, GA	13,740	5.38	1.07	$11.80	$24,550
Columbus, OH	11,530	11.27	2.24	$11.33	$23,560
Riverside-San Bernardino-Ontario, CA	11,430	8.39	1.67	$12.86	$26,750
Houston-The Woodlands-Sugar Land, TX	10,920	3.72	0.74	$11.35	$23,610
Indianapolis-Carmel-Anderson, IN	9,910	9.77	1.94	$11.00	$22,880
Cincinnati, OH-KY-IN	8,780	8.42	1.68	$11.98	$24,910



Metropolitan areas with the highest concentration of jobs and location quotients in this occupation:

Metropolitan area	Employment (1)	Employment per thousand jobs	Location quotient (9)	Hourly mean wage	Annual mean wage (2)
Monroe, MI	880	22.45	4.47	$14.30	$29,740
New Bedford, MA	1,240	19.42	3.86	$11.82	$24,580
Taunton-Middleborough-Norton, MA NECTA Division	1,030	17.77	3.54	$13.08	$27,200
Vineland-Bridgeton, NJ	1,000	16.72	3.33	$11.23	$23,350
Merced, CA	1,080	16.46	3.27	$11.11	$23,120
Yakima, WA	1,200	14.15	2.81	$12.31	$25,600
Grand Rapids-Wyoming, MI	7,780	14.09	2.80	$10.74	$22,330
Goldsboro, NC	530	13.05	2.60	$10.60	$22,040
Mansfield, OH	660	13.01	2.59	$9.46	$19,670
Staunton-Waynesboro, VA	620	12.95	2.58	$14.11	$29,340

Annual mean wage of packers and packagers, hand, by area, May 2016



Top paying metropolitan areas for this occupation:

Metropolitan area	Employment (1)	Employment per thousand jobs	Location quotient (9)	Hourly mean wage	Annual mean wage (2)
Sheboygan, WI	410	7.01	1.40	$17.53	$36,470
Hagerstown-Martinsburg, MD-WV	340	3.35	0.67	$17.13	$35,630
Fairbanks, AK	140	3.66	0.73	$16.76	$34,860
Springfield, MA-CT	1,660	5.19	1.03	$16.73	$34,790
East Stroudsburg, PA	(8)	(8)	(8)	$16.62	$34,560
Texarkana, TX-AR	90	1.70	0.34	$16.43	$34,180
Wausau, WI	670	9.61	1.91	$16.13	$33,550
Madison, WI	2,730	7.15	1.42	$15.60	$32,440
Albany-Schenectady-Troy, NY	1,150	2.60	0.52	$15.55	$32,340
San Rafael, CA Metropolitan Division	350	3.13	0.62	$15.29	$31,800

Nonmetropolitan areas with the highest employment in this occupation:

Nonmetropolitan area	Employment (1)	Employment per thousand jobs	Location quotient (9)	Hourly mean wage	Annual mean wage (2)
West Northwestern Ohio nonmetropolitan area	2,340	9.25	1.84	$12.98	$27,000
Central Indiana nonmetropolitan area	2,280	14.37	2.86	$11.50	$23,910
Southeast Coastal North Carolina nonmetropolitan area	2,170	8.75	1.74	$11.80	$24,530
North Northeastern Ohio non-metropolitan area (non-contiguous)	2,140	6.49	1.29	$13.21	$27,470
Northern Indiana nonmetropolitan area	1,820	8.46	1.68	$11.50	$23,920

Nonmetropolitan areas with the highest concentration of jobs and location quotients in this occupation:

Nonmetropolitan area	Employment (1)	Employment per thousand jobs	Location quotient (9)	Hourly mean wage	Annual mean wage (2)
Central Washington nonmetropolitan area	520	16.00	3.18	$11.60	$24,120
Central Indiana nonmetropolitan area	2,280	14.37	2.86	$11.50	$23,910
Northeast Coastal North Carolina nonmetropolitan area	1,120	11.73	2.33	$9.99	$20,780
Western Wisconsin nonmetropolitan area	1,620	11.59	2.31	$12.39	$25,760
Southwest Iowa nonmetropolitan area	970	11.40	2.27	$13.17	$27,390

Top paying nonmetropolitan areas for this occupation:

Nonmetropolitan area	Employment (1)	Employment per thousand jobs	Location quotient (9)	Hourly mean wage	Annual mean wage (2)
Northern Mountains Region of California nonmetropolitan area	340	5.35	1.06	$16.96	$35,270
Balance of Alaska nonmetropolitan area	70	0.99	0.20	$15.88	$33,030
Northwest Washington nonmetropolitan area	300	6.05	1.20	$15.34	$31,900
Southeast Alaska nonmetropolitan area	130	3.78	0.75	$14.37	$29,890
Central Oregon nonmetropolitan area	490	8.44	1.68	$13.80	$28,710

About May 2016 National, State, Metropolitan, and Nonmetropolitan Area Occupational Employment and Wage Estimates

These estimates are calculated with data collected from employers in all industry sectors, all metropolitan and nonmetropolitan areas, and all states and the District of Columbia. The top employment and wage figures are provided above. The complete list is available in the downloadable XLS files.

The percentile wage estimate is the value of a wage below which a certain percent of workers fall. The median wage is the 50th percentile wage estimate—50 percent of workers earn less than the median and 50 percent of workers earn more than the median. More about percentile wages.

(1) Estimates for detailed occupations do not sum to the totals because the totals include occupations not shown separately. Estimates do not include self-employed workers.

(2) Annual wages have been calculated by multiplying the hourly mean wage by a "year-round, full-time" hours figure of 2,080 hours; for those occupations where there is not an hourly wage published, the annual wage has been directly calculated from the reported survey data.

(3) The relative standard error (RSE) is a measure of the reliability of a survey statistic. The smaller the relative standard error, the more precise the estimate.

(8) Estimate not released.

(9) The location quotient is the ratio of the area concentration of occupational employment to the national average concentration. A location quotient greater than one indicates the occupation has a higher share of employment than average, and a location quotient less than one indicates the occupation is less prevalent in the area than average.

Other OES estimates and related information:

May 2016 National Occupational Employment and Wage Estimates

May 2016 State Occupational Employment and Wage Estimates

May 2016 Metropolitan and Nonmetropolitan Area Occupational Employment and Wage Estimates

May 2016 National Industry-Specific Occupational Employment and Wage Estimates

May 2016 Occupation Profiles

Technical Notes

Last Modified Date: March 31, 2017

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Occupational Employment and Wages, May 2016

41-2031 Retail Salespersons

Sell merchandise, such as furniture, motor vehicles, appliances, or apparel to consumers. Excludes "Cashiers" (41-2011).

National estimates for this occupation
Industry profile for this occupation
Geographic profile for this occupation

National estimates for this occupation: Top

Employment estimate and mean wage estimates for this occupation:

Employment (1)	Employment RSE (3)	Mean hourly wage	Mean annual wage (2)	Wage RSE (3)
4,528,550	0.4 %	$13.07	$27,180	0.2 %

Percentile wage estimates for this occupation:

Percentile	10%	25%	50% (Median)	75%	90%
Hourly Wage	$8.56	$9.33	$10.90	$14.17	$19.91
Annual Wage (2)	$17,810	$19,410	$22,680	$29,480	$41,420

Industry profile for this occupation: Top

Industries with the highest published employment and wages for this occupation are provided. For a list of all industries with employment in this occupation, see the Create Customized Tables function.

Industries with the highest levels of employment in this occupation:

Industry	Employment (1)	Percent of industry employment	Hourly mean wage	Annual mean wage (2)
Clothing Stores	729,450	70.70	$11.58	$24,090
Department Stores	446,640	32.62	$11.16	$23,220
Other General Merchandise Stores	445,110	23.41	$11.44	$23,800
Building Material and Supplies Dealers	410,890	36.69	$14.14	$29,410
Sporting Goods, Hobby, and Musical Instrument Stores	320,180	57.06	$11.48	$23,880

Industries with the highest concentration of employment in this occupation:

Industry	Employment (1)	Percent of industry employment	Hourly mean wage	Annual mean wage (2)
Shoe Stores	159,580	73.61	$11.26	$23,410
Clothing Stores	729,450	70.70	$11.58	$24,090
Jewelry, Luggage, and Leather Goods Stores	86,730	63.31	$14.09	$29,320
Sporting Goods, Hobby, and Musical Instrument Stores	320,180	57.06	$11.48	$23,880
Book Stores and News Dealers	50,310	56.87	$10.37	$21,580

Top paying industries for this occupation:

Industry	Employment (1)	Percent of industry employment	Hourly mean wage	Annual mean wage (2)
Plastics Product Manufacturing	160	0.03	$26.55	$55,220
Nonmetallic Mineral Mining and Quarrying	50	0.06	$24.11	$50,150
Motor Vehicle Body and Trailer Manufacturing	180	0.12	$22.82	$47,460

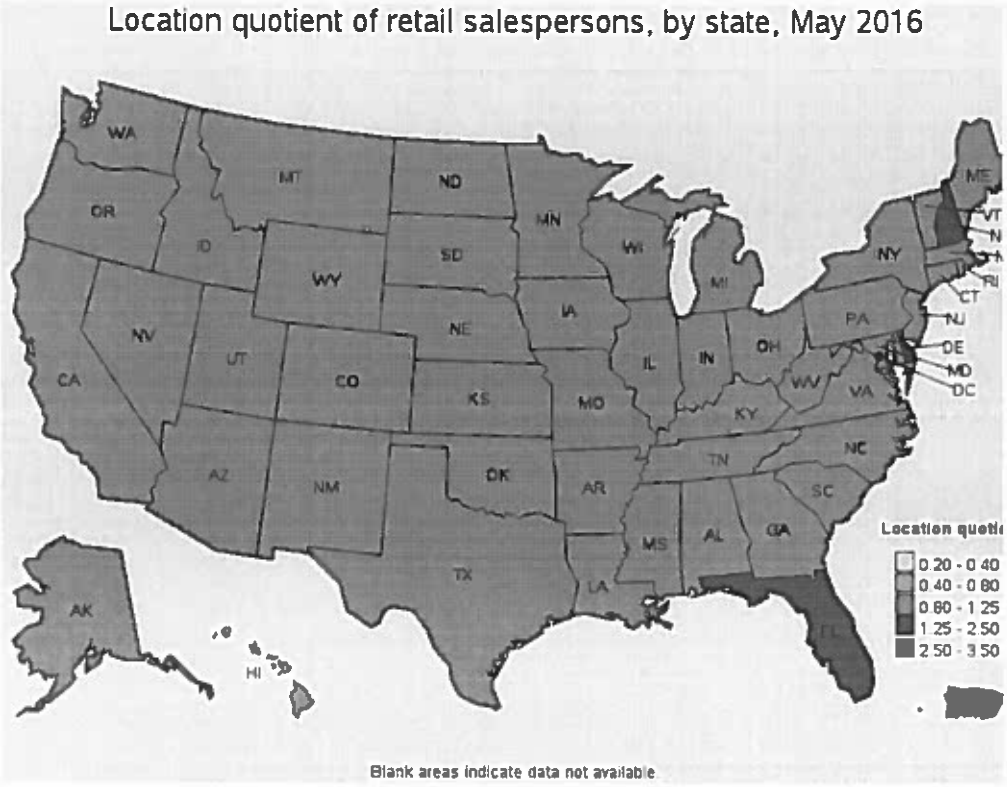
Automobile Dealers	276,780	21.75	$21.97	$45,690
Building Finishing Contractors	1,480	0.19	$21.30	$44,310

Geographic profile for this occupation: Top

States and areas with the highest published employment, location quotients, and wages for this occupation are provided. For a list of all areas with employment in this occupation, see the Create Customized Tables function.

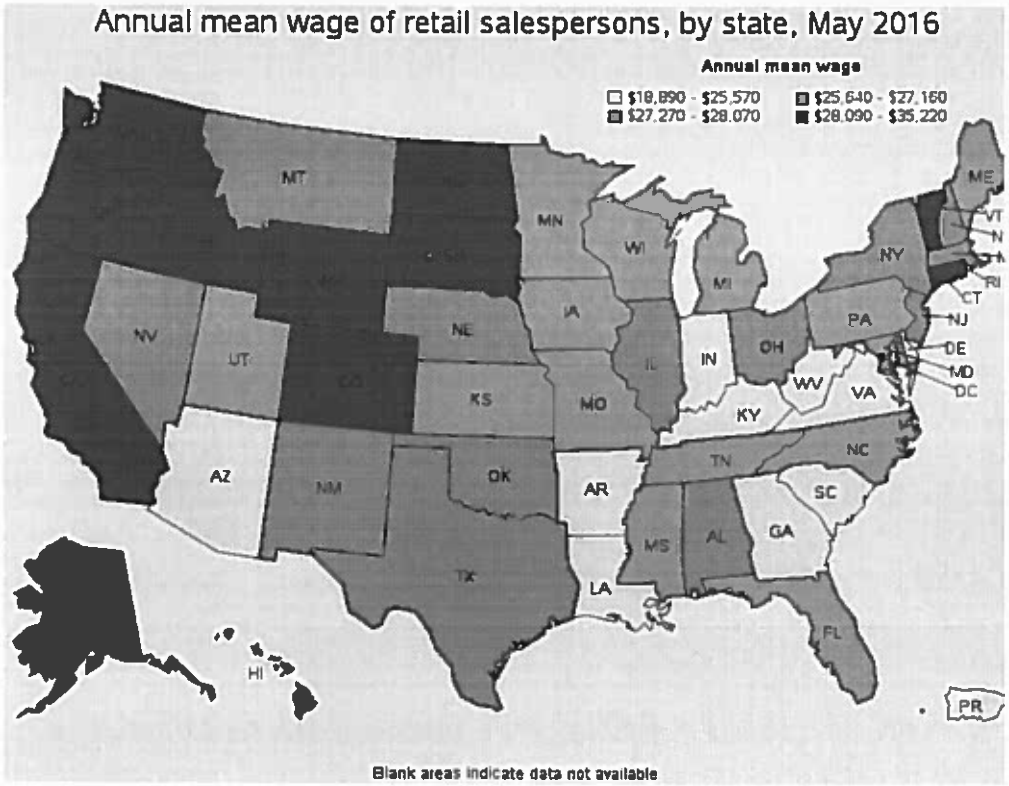
States with the highest employment level in this occupation

State	Employment (1)	Employment per thousand jobs	Location quotient (9)	Hourly mean wage	Annual mean wage (2)
California	440,440	27.59	0.86	$14.33	$29,810
Texas	383,080	32.62	1.01	$13.16	$27,360
Florida	339,070	41.24	1.28	$12.39	$25,770
New York	322,970	35.50	1.10	$13.35	$27,770
Illinois	186,820	31.64	0.98	$13.44	$27,950



States with the highest concentration of jobs and location quotients in this occupation:

State	Employment (1)	Employment per thousand jobs	Location quotient (9)	Hourly mean wage	Annual mean wage (2)
Florida	339,070	41.24	1.28	$12.39	$25,770
Delaware	17,750	40.27	1.25	$12.04	$25,040
New Hampshire	25,920	40.19	1.25	$13.22	$27,490
Nevada	49,650	39.07	1.21	$13.13	$27,310
Idaho	25,270	38.09	1.18	$13.51	$28,090

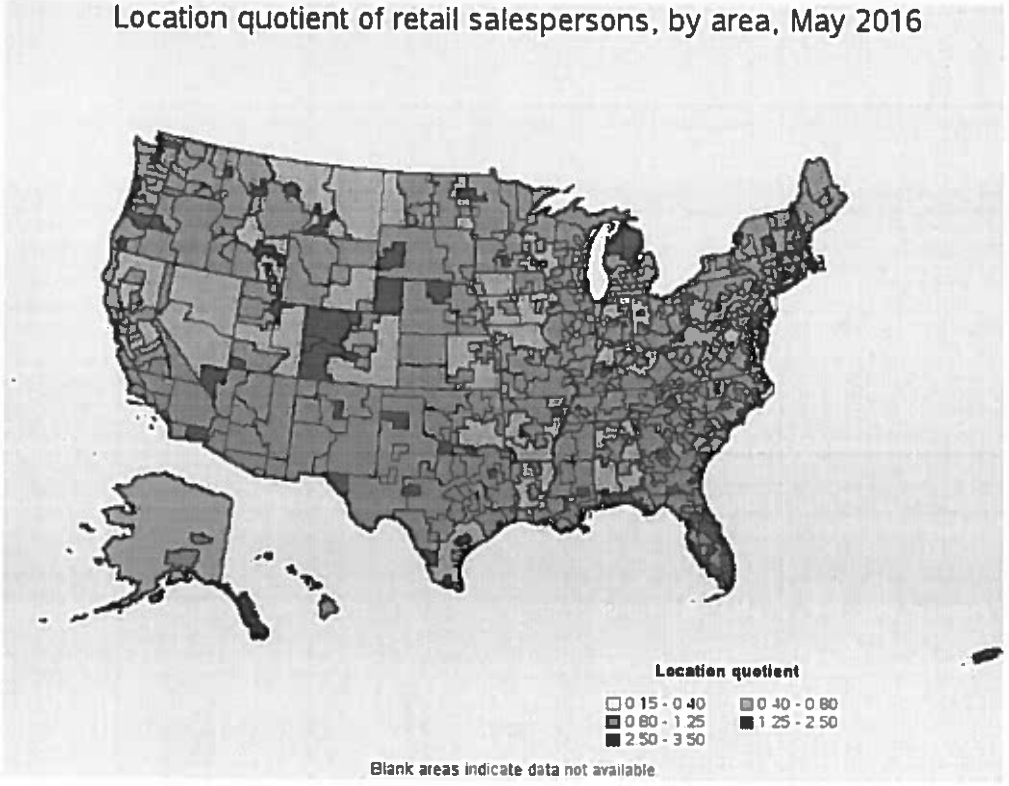


Top paying States for this occupation:

State	Employment (1)	Employment per thousand jobs	Location quotient (9)	Hourly mean wage	Annual mean wage (2)
District of Columbia	6,500	9.25	0.29	$16.94	$35,220
North Dakota	13,610	32.01	0.99	$15.49	$32,230
Rhode Island	13,720	28.87	0.89	$15.41	$32,050
Washington	101,850	33.21	1.03	$15.05	$31,310
Vermont	9,100	29.86	0.93	$14.54	$30,240

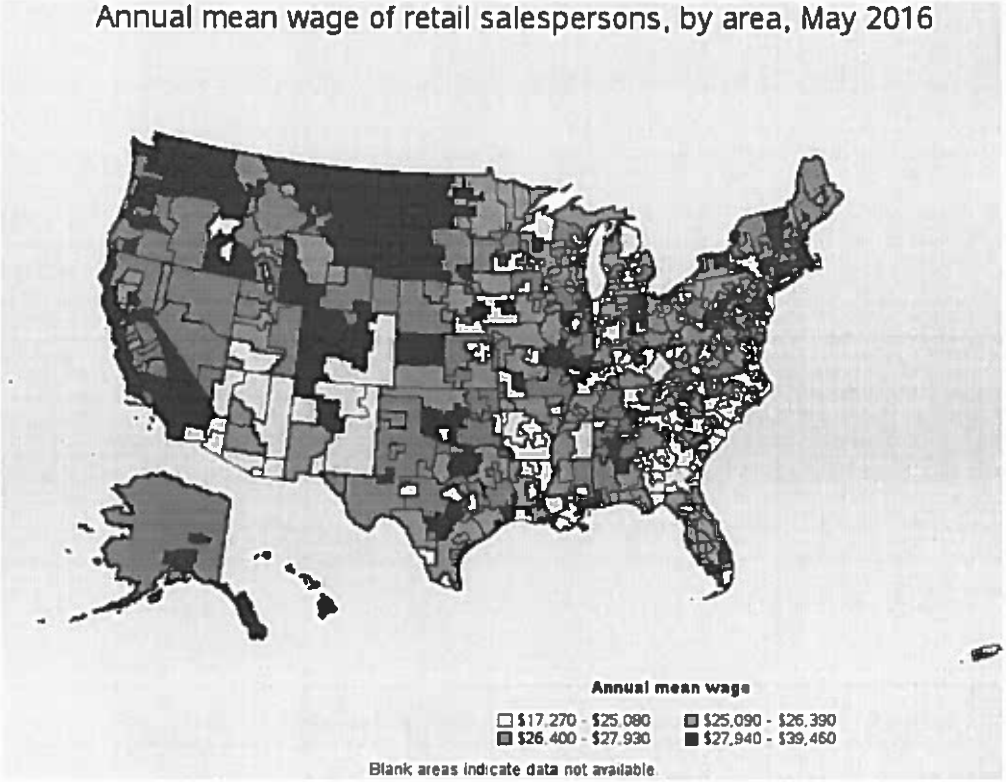
Metropolitan areas with the highest employment level in this occupation:

Metropolitan area	Employment (1)	Employment per thousand jobs	Location quotient (9)	Hourly mean wage	Annual mean wage (2)
New York-Jersey City-White Plains, NY-NJ Metropolitan Division	227,170	34.49	1.07	$13.18	$27,420
Los Angeles-Long Beach-Glendale, CA Metropolitan Division	113,250	26.83	0.83	$14.32	$29,780
Chicago-Naperville-Arlington Heights, IL Metropolitan Division	112,920	31.03	0.96	$13.67	$28,430
Houston-The Woodlands-Sugar Land, TX	88,310	30.09	0.93	$12.66	$26,340
Atlanta-Sandy Springs-Roswell, GA	85,800	33.60	1.04	$12.25	$25,490
Dallas-Plano-Irving, TX Metropolitan Division	74,180	30.53	0.95	$13.85	$28,800
Phoenix-Mesa-Scottsdale, AZ	67,450	34.85	1.08	$12.30	$25,570
Washington-Arlington-Alexandria, DC-VA-MD-WV Metropolitan Division	63,820	25.62	0.79	$12.88	$26,780
Minneapolis-St. Paul-Bloomington, MN-WI	56,110	29.37	0.91	$12.79	$26,600
Nassau County-Suffolk County, NY Metropolitan Division	53,700	41.75	1.29	$14.38	$29,910



Metropolitan areas with the highest concentration of jobs and location quotients in this occupation

Metropolitan area	Employment (1)	Employment per thousand jobs	Location quotient (9)	Hourly mean wage	Annual mean wage (2)
Daphne-Fairhope-Foley, AL	4,770	68.30	2.12	$13.24	$27,530
Punta Gorda, FL	3,010	67.08	2.08	$12.40	$25,780
East Stroudsburg, PA	3,450	63.25	1.96	$12.13	$25,220
Sebastian-Vero Beach, FL	2,900	60.10	1.86	$12.26	$25,500
Myrtle Beach-Conway-North Myrtle Beach, SC-NC	9,050	59.32	1.84	$11.53	$23,990
Saginaw, MI	5,080	59.23	1.84	$11.75	$24,440
Hot Springs, AR	2,060	58.17	1.80	$11.67	$24,270
Parkersburg-Vienna, WV	2,200	57.24	1.77	$11.09	$23,060
Lynn-Saugus-Marblehead, MA NECTA Division	2,440	56.98	1.77	$15.28	$31,780
Crestview-Fort Walton Beach-Destin, FL	5,980	56.45	1.75	$12.66	$26,330



Top paying metropolitan areas for this occupation:

Metropolitan area	Employment (1)	Employment per thousand jobs	Location quotient (9)	Hourly mean wage	Annual mean wage (2)
San Rafael, CA Metropolitan Division	3,830	34.35	1.07	$18.97	$39,460
Greeley, CO	2,760	28.68	0.89	$16.87	$35,090
Tacoma-Lakewood, WA Metropolitan Division	10,530	36.86	1.14	$16.51	$34,330
Sherman-Denison, TX	1,750	40.33	1.25	$16.05	$33,390
Bridgeport-Stamford-Norwalk, CT	14,920	35.63	1.10	$15.83	$32,920
San Francisco-Redwood City-South San Francisco, CA Metropolitan Division	21,410	20.06	0.62	$15.82	$32,900
Boulder, CO	5,490	31.16	0.97	$15.71	$32,680
Carson City, NV	850	30.40	0.94	$15.59	$32,420
Napa, CA	2,310	32.68	1.01	$15.41	$32,060
Bismarck, ND	2,940	39.50	1.22	$15.39	$32,000

Nonmetropolitan areas with the highest employment in this occupation:

Nonmetropolitan area	Employment (1)	Employment per thousand jobs	Location quotient (9)	Hourly mean wage	Annual mean wage (2)
North Northeastern Ohio non-metropolitan area (non-contiguous)	9,040	27.36	0.85	$12.40	$25,800
Balance of Lower Peninsula of Michigan nonmetropolitan area	8,390	30.12	0.93	$12.22	$25,420
North Texas nonmetropolitan area	8,230	30.90	0.96	$12.12	$25,220
Piedmont North Carolina nonmetropolitan area	7,740	30.36	0.94	$11.71	$24,350
Southeast Coastal North Carolina nonmetropolitan area	7,010	28.25	0.88	$11.58	$24,090

Nonmetropolitan areas with the highest concentration of jobs and location quotients in this occupation:

Nonmetropolitan area	Employment (1)	Employment per thousand jobs	Location quotient (9)	Hourly mean wage	Annual mean wage (2)
Nantucket Island and Martha's Vineyard nonmetropolitan area	1,220	70.14	2.17	$15.61	$32,460
Wasatch Back nonmetropolitan area	1,720	52.08	1.61	$13.41	$27,890
Southeast Alaska nonmetropolitan area	1,750	49.78	1.54	$13.90	$28,910
North Coast Oregon nonmetropolitan area	2,140	49.22	1.53	$12.59	$26,180
Northern New Hampshire nonmetropolitan area	1,750	47.21	1.46	$12.32	$25,640

Top paying nonmetropolitan areas for this occupation

Nonmetropolitan area	Employment (1)	Employment per thousand jobs	Location quotient (9)	Hourly mean wage	Annual mean wage (2)
Far West North Dakota nonmetropolitan area	1,390	21.39	0.66	$18.31	$38,080
West Central North Dakota nonmetropolitan area	1,910	32.06	0.99	$16.45	$34,210
Northwest Colorado nonmetropolitan area	4,960	43.08	1.34	$16.41	$34,130
Northeast Wyoming nonmetropolitan area	1,300	27.00	0.84	$16.15	$33,580
East Central North Dakota nonmetropolitan area	1,040	25.73	0.80	$16.13	$33,550

About May 2016 National, State, Metropolitan, and Nonmetropolitan Area Occupational Employment and Wage Estimates

These estimates are calculated with data collected from employers in all industry sectors, all metropolitan and nonmetropolitan areas, and all states and the District of Columbia. The top employment and wage figures are provided above. The complete list is available in the downloadable XLS files.

The percentile wage estimate is the value of a wage below which a certain percent of workers fall. The median wage is the 50th percentile wage estimate--50 percent of workers earn less than the median and 50 percent of workers earn more than the median. More about percentile wages.

(1) Estimates for detailed occupations do not sum to the totals because the totals include occupations not shown separately. Estimates do not include self-employed workers.

(2) Annual wages have been calculated by multiplying the hourly mean wage by a "year-round, full-time" hours figure of 2,080 hours; for those occupations where there is not an hourly wage published, the annual wage has been directly calculated from the reported survey data.

(3) The relative standard error (RSE) is a measure of the reliability of a survey statistic. The smaller the relative standard error, the more precise the estimate.

(9) The location quotient is the ratio of the area concentration of occupational employment to the national average concentration. A location quotient greater than one indicates the occupation has a higher share of employment than average, and a location quotient less than one indicates the occupation is less prevalent in the area than average.

Other OES estimates and related information:

May 2016 National Occupational Employment and Wage Estimates

May 2016 State Occupational Employment and Wage Estimates

May 2016 Metropolitan and Nonmetropolitan Area Occupational Employment and Wage Estimates

May 2016 National Industry-Specific Occupational Employment and Wage Estimates

May 2016 Occupation Profiles

Technical Notes

Last Modified Date: March 31, 2017

U.S. Bureau of Labor Statistics | Division of Occupational Employment Statistics, PSB Suite 2135, 2 Massachusetts Avenue, NE Washington, DC 20212-0001
www.bls.gov/OES | Telephone: 1-202-691-6569 | Contact OES

Occupational Employment Statistics

Occupational Employment and Wages, May 2016

37-2019 Building Cleaning Workers, All Other

All building cleaning workers not listed separately.

National estimates for this occupation
Industry profile for this occupation
Geographic profile for this occupation

National estimates for this occupation: Top

Employment estimate and mean wage estimates for this occupation:

Employment (1)	Employment RSE (3)	Mean hourly wage	Mean annual wage (2)	Wage RSE (3)
15,020	12.5 %	$14.88	$30,960	2.8 %

Percentile wage estimates for this occupation:

Percentile	10%	25%	50% (Median)	75%	90%
Hourly Wage	$9.34	$11.01	$14.28	$17.96	$21.70
Annual Wage (2)	$19,430	$22,900	$29,700	$37,360	$45,140

Industry profile for this occupation: Top

Industries with the highest published employment and wages for this occupation are provided. For a list of all industries with employment in this occupation, see the Create Customized Tables function.

Industries with the highest levels of employment in this occupation:

Industry	Employment (1)	Percent of industry employment	Hourly mean wage	Annual mean wage (2)
Services to Buildings and Dwellings	11,670	0.56	$15.10	$31,400
Residential Building Construction	480	0.07	$14.65	$30,460
Remediation and Other Waste Management Services	350	0.25	$16.65	$34,640
General Medical and Surgical Hospitals	200	0.00	$14.08	$29,290
Colleges, Universities, and Professional Schools	150	0.00	$17.65	$36,700

Industries with the highest concentration of employment in this occupation:

Industry	Employment (1)	Percent of industry employment	Hourly mean wage	Annual mean wage (2)
Services to Buildings and Dwellings	11,670	0.56	$15.10	$31,400
Remediation and Other Waste Management Services	350	0.25	$16.65	$34,640
Residential Building Construction	480	0.07	$14.65	$30,460
Facilities Support Services	50	0.04	$13.88	$28,860
Lessors of Real Estate	110	0.02	$11.87	$24,680

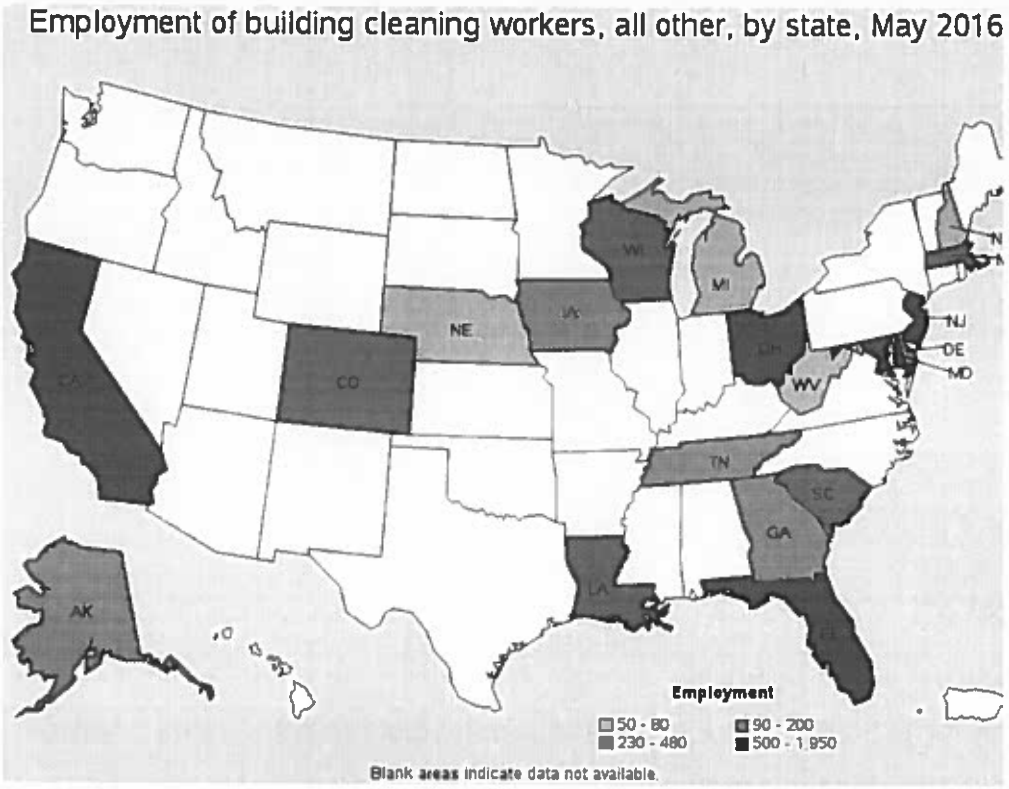
Top paying industries for this occupation:

Industry	Employment (1)	Percent of industry employment	Hourly mean wage	Annual mean wage (2)
Nonresidential Building Construction	70	0.01	$23.06	$47,950
Elementary and Secondary Schools	70	(7)	$18.58	$38,650
Colleges, Universities, and Professional Schools	150	(7)	$17.65	$36,700

Medical Equipment and Supplies Manufacturing	40	0.01	$16.98	$35,320
Remediation and Other Waste Management Services	350	0.25	$16.65	$34,640

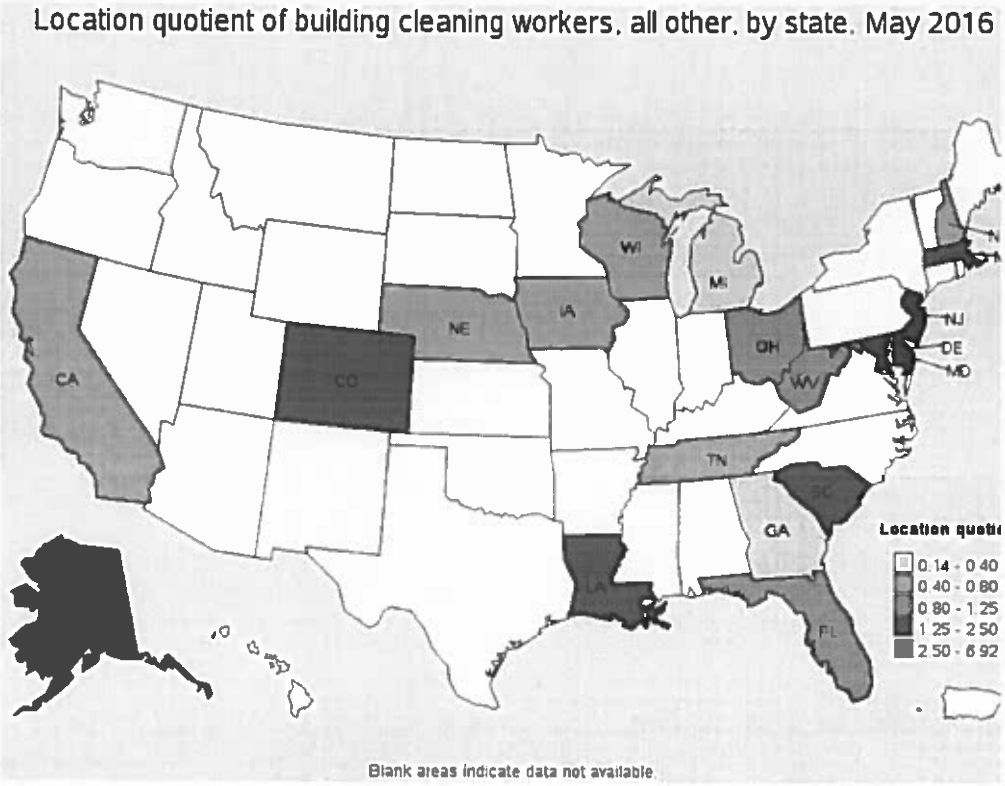
Geographic profile for this occupation: Top

States and areas with the highest published employment, location quotients, and wages for this occupation are provided. For a list of all areas with employment in this occupation, see the Create Customized Tables function.



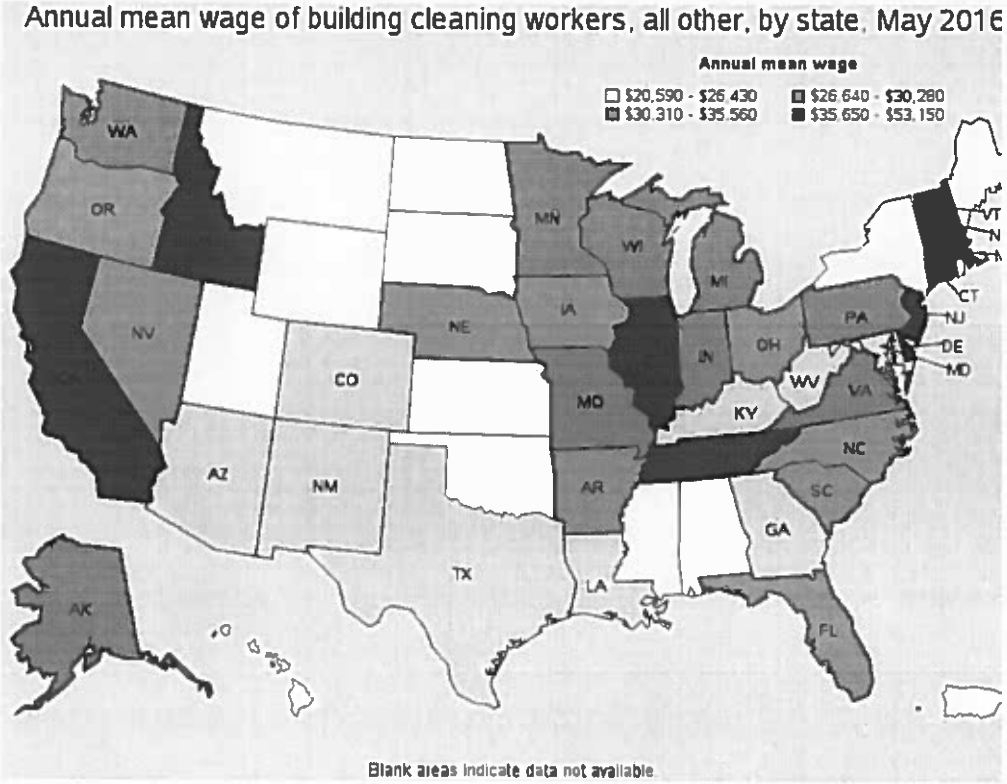
States with the highest employment level in this occupation:

State	Employment (1)	Employment per thousand jobs	Location quotient (9)	Hourly mean wage	Annual mean wage (2)
Maryland	1,950	0.74	6.92	$11.33	$23,560
New Jersey	1,400	0.35	3.31	$17.14	$35,650
California	1,230	0.08	0.72	$18.79	$39,090
Florida	1,000	0.12	1.14	$13.17	$27,390
Ohio	500	0.09	0.88	$12.81	$26,640



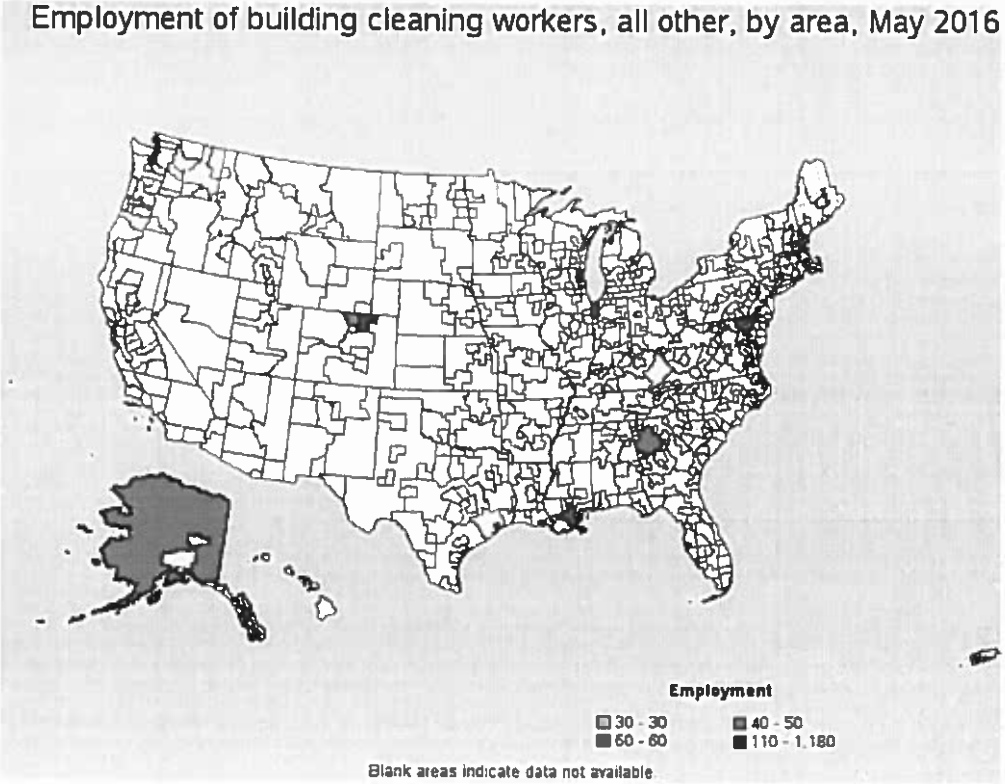
States with the highest concentration of jobs and location quotients in this occupation:

State	Employment (1)	Employment per thousand jobs	Location quotient (9)	Hourly mean wage	Annual mean wage (2)
Maryland	1,950	0.74	6.92	$11.33	$23,560
Delaware	170	0.38	3.60	$18.91	$39,340
New Jersey	1,400	0.35	3.31	$17.14	$35,650
Alaska	110	0.35	3.28	$16.86	$35,060
Louisiana	360	0.19	1.77	$11.79	$24,530



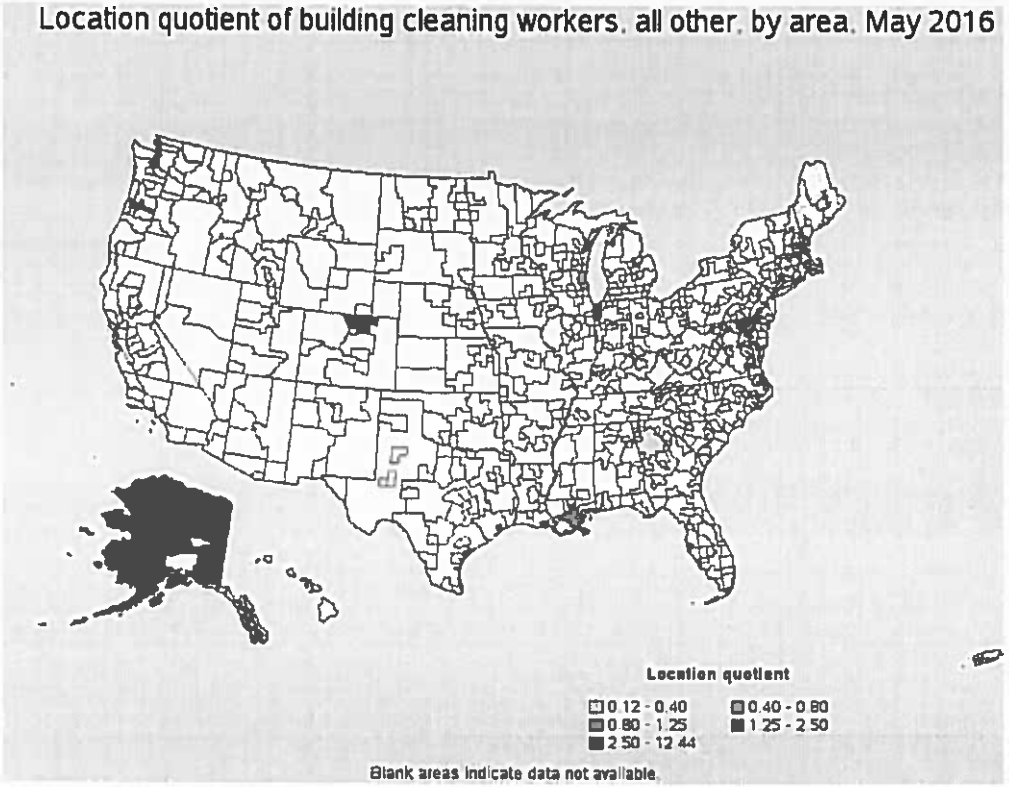
Top paying States for this occupation:

State	Employment (1)	Employment per thousand jobs	Location quotient (9)	Hourly mean wage	Annual mean wage (2)
Idaho	(8)	(8)	(8)	$25.55	$53,150
Illinois	(8)	(8)	(8)	$23.90	$49,710
Connecticut	(8)	(8)	(8)	$21.33	$44,360
Delaware	170	0.38	3.60	$18.91	$39,340
California	1,230	0.08	0.72	$18.79	$39,090



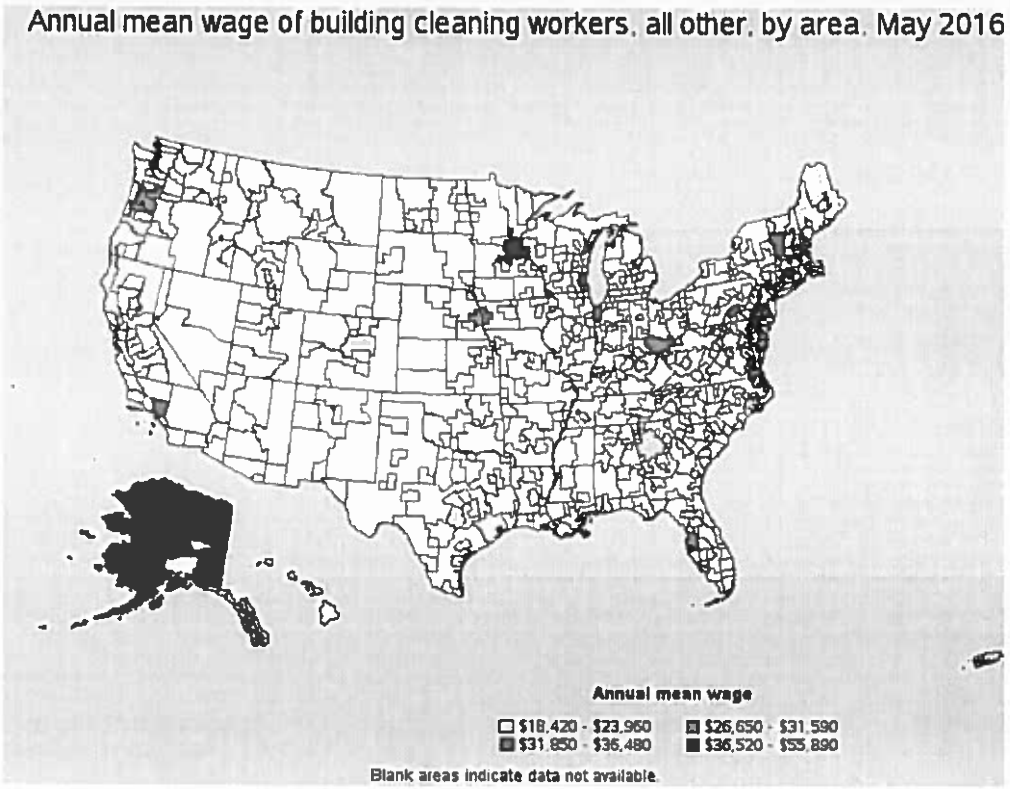
Metropolitan areas with the highest employment level in this occupation:

Metropolitan area	Employment (1)	Employment per thousand jobs	Location quotient (9)	Hourly mean wage	Annual mean wage (2)
Baltimore-Columbia-Towson, MD	1,180	0.88	8.19	$11.13	$23,150
Greeley, CO	130	1.33	12.44	$10.84	$22,540
Wilmington, DE-MD-NJ Metropolitan Division	110	0.33	3.10	$17.56	$36,520
Gary, IN Metropolitan Division	60	0.23	2.16	$17.54	$36,480
New Orleans-Metairie, LA	60	0.11	1.01	$11.20	$23,300
Milwaukee-Waukesha-West Allis, WI	60	0.07	0.61	$16.54	$34,410
Atlanta-Sandy Springs-Roswell, GA	50	0.02	0.19	$11.52	$23,960
Fort Collins, CO	40	0.26	2.47	(8)	(8)
Salem, OR	30	0.20	1.86	$13.52	$28,120



Metropolitan areas with the highest concentration of jobs and location quotients in this occupation:

Metropolitan area	Employment (1)	Employment per thousand jobs	Location quotient (9)	Hourly mean wage	Annual mean wage (2)
Greeley, CO	130	1.33	12.44	$10.84	$22,540
Baltimore-Columbia-Towson, MD	1,180	0.88	8.19	$11.13	$23,150
Wilmington, DE-MD-NJ Metropolitan Division	110	0.33	3.10	$17.56	$36,520
Fort Collins, CO	40	0.26	2.47	(8)	(8)
Gary, IN Metropolitan Division	60	0.23	2.16	$17.54	$36,480
Salem, OR	30	0.20	1.86	$13.52	$28,120
New Orleans-Metairie, LA	60	0.11	1.01	$11.20	$23,300
Milwaukee-Waukesha-West Allis, WI	60	0.07	0.61	$16.54	$34,410
Atlanta-Sandy Springs-Roswell, GA	50	0.02	0.19	$11.52	$23,960



Top paying metropolitan areas for this occupation:

Metropolitan area	Employment (1)	Employment per thousand jobs	Location quotient (9)	Hourly mean wage	Annual mean wage (2)
Dover, DE	(8)	(8)	(8)	$26.87	$55,890
Hartford-West Hartford-East Hartford, CT	(8)	(8)	(8)	$22.45	$46,700
Minneapolis-St. Paul-Bloomington, MN-WI	(8)	(8)	(8)	$19.11	$39,750
New York-Jersey City-White Plains, NY-NJ Metropolitan Division	(8)	(8)	(8)	$18.48	$38,430
Montgomery County-Bucks County-Chester County, PA Metropolitan Division	(8)	(8)	(6)	$17.73	$36,870
Wilmington, DE-MD-NJ Metropolitan Division	110	0.33	3.10	$17.56	$36,520
Gary, IN Metropolitan Division	60	0.23	2.16	$17.54	$36,480
Los Angeles-Long Beach-Glendale, CA Metropolitan Division	(8)	(8)	(8)	$17.32	$36,020
Milwaukee-Waukesha-West Allis, WI	60	0.07	0.61	$16.54	$34,410
Camden, NJ Metropolitan Division	(8)	(8)	(8)	$16.18	$33,660

Nonmetropolitan areas with the highest employment in this occupation:

Nonmetropolitan area	Employment (1)	Employment per thousand jobs	Location quotient (9)	Hourly mean wage	Annual mean wage (2)
Balance of Alaska nonmetropolitan area	40	0.55	5.15	$20.13	$41,880

Nonmetropolitan areas with the highest concentration of jobs and location quotients in this occupation:

Nonmetropolitan area	Employment (1)	Employment per thousand jobs	Location quotient (9)	Hourly mean wage	Annual mean wage (2)

Balance of Alaska nonmetropolitan area	40	0.55	5.15	$20.13	$41,880

Top paying nonmetropolitan areas for this occupation:

Nonmetropolitan area	Employment (1)	Employment per thousand jobs	Location quotient (9)	Hourly mean wage	Annual mean wage (2)
Balance of Alaska nonmetropolitan area	40	0.55	5.15	$20.13	$41,880
Southern Vermont nonmetropolitan area	(8)	(8)	(8)	$15.31	$31,850
Southern Ohio non-metropolitan area	(8)	(8)	(8)	$14.30	$29,740

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The percentile wage estimate is the value of a wage below which a certain percent of workers fall. The median wage is the 50th percentile wage estimate—50 percent of workers earn less than the median and 50 percent of workers earn more than the median. More about percentile wages.

(1) Estimates for detailed occupations do not sum to the totals because the totals include occupations not shown separately. Estimates do not include self-employed workers.

(2) Annual wages have been calculated by multiplying the hourly mean wage by a "year-round, full-time" hours figure of 2,080 hours; for those occupations where there is not an hourly wage published, the annual wage has been directly calculated from the reported survey data.

(3) The relative standard error (RSE) is a measure of the reliability of a survey statistic. The smaller the relative standard error, the more precise the estimate.

(7) The value is less than .005 percent of industry employment.

(8) Estimate not released.

(9) The location quotient is the ratio of the area concentration of occupational employment to the national average concentration. A location quotient greater than one indicates the occupation has a higher share of employment than average, and a location quotient less than one indicates the occupation is less prevalent in the area than average.

Other OES estimates and related information:

May 2016 National Occupational Employment and Wage Estimates

May 2016 State Occupational Employment and Wage Estimates

May 2016 Metropolitan and Nonmetropolitan Area Occupational Employment and Wage Estimates

May 2016 National Industry-Specific Occupational Employment and Wage Estimates

May 2016 Occupation Profiles

Technical Notes

Last Modified Date: March 31, 2017

U.S. Bureau of Labor Statistics | Division of Occupational Employment Statistics, PSB Suite 2135, 2 Massachusetts Avenue, NE Washington, DC 20212-0001
www.bls.gov/OES | Telephone: 1-202-691-6569 | Contact OES

U.S. Department of Transportation

Office of the Secretary of Transportation

Assistant Secretary

1200 New Jersey Avenue SE
Washington, DC 20590

September 27, 2016

MEMORANDUM TO: SECRETARIAL OFFICERS
MODAL ADMINISTRATORS

From: Vinn White
Acting Assistant Secretary for Transportation Policy, x69044

Subject: Revised Departmental Guidance on Valuation of Travel Time in Economic Analysis

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The value of travel time is a critical factor in evaluating the benefits of transportation infrastructure investment and rulemaking initiatives. Reduction of delay in passenger or freight transportation is a major purpose of investments, and rules to enhance safety sometimes include provisions that slow travel. As the Department expands its use of benefit-cost analysis in evaluating competitive funding applications under such programs as the TIGER and FASTLANE Grant programs and the High-Speed Intercity Passenger Rail program, it is essential to have appropriate, well-reasoned guidance for valuing delays and time savings.

This version of the guidance updates the value of travel time savings with median household income information for 2015 from the Census Bureau and salary information from the Bureau of Labor Statistics National Occupational Employment and Wage Estimates from May 2015. The household income data are drawn from the Census Bureau's Current Population Survey, Annual Social and Economic Supplements, and are not released until the September following the year in which they are collected; the 2015 data are thus the most recent data available. The percentages of earnings used to determine the value of travel time savings (shown in tables 1 and 2) remain unchanged. The revised dollar values of travel time savings are shown in tables 3, 4, and 5.

DOT published its first guidance on this subject, "Departmental Guidance for the Valuation of Travel Time in Economic Analysis," on April 9, 1997, to assist analysts in developing consistent evaluations of actions that save or cost time in travel. That memorandum recommended an array of values for different categories of travel, according to purpose, mode and distance. For each category, the Guidance specified a percentage of hourly income that would normally be used to determine the value per hour of savings in

travel time, a range of percentages defining upper and lower bounds about the normal value for sensitivity testing, and an average hourly income level. Special values were assigned to walking and waiting time, travel by general aviation, and truck drivers.

Revised guidance, labeled as "Revision 1," was issued on February 11, 2003. A further revision, labeled "Revision 2," was issued on September 28, 2011 and adjusted these values for use in 2011, incorporated some additional values and procedures, and redefined the sources of data. In particular, time savings in high-speed rail travel were identified as equivalent to those in air travel and distinguished from intercity travel by conventional surface modes. Although we found no need to alter the normal percentages of hourly income and the ranges of percentages that were assigned in the 1997 memorandum, more recent and appropriate sources were used to specify hourly incomes. In particular, the income data used in that guidance were derived from public and regularly updated sources that allow the Department to update the values annually. This revision also included a bibliography of documents available online that provide an overview of the research literature in the field and the recommendations developed by experts in several countries.

A link to this revised guidance will be found on the Office of Transportation Policy website at: http://www.dot.gov/policy/transportation-policy/economy. Questions should be addressed to Darren Timothy ((202) 366-4051 or darren.timothy@dot.gov) in the Office of Transportation Policy.

Attachment

cc: Regulations Officers and Liaison Officers

The Value of Travel Time Savings: Departmental Guidance for Conducting Economic Evaluations Revision 2 (2016 Update)

Introduction

Many actions by the Department of Transportation and other governmental agencies are designed to benefit travelers by reducing the time spent in traveling. Actions in pursuit of other goals such as improved safety may also have the intended or unavoidable consequence of slowing travel. The purpose of this document is to state the procedures approved for use by all administrations within DOT when evaluating reductions or increases in passenger travel time that result from such actions. The value of travel time savings (VTTS) derived here is to be used in all DOT benefit-cost or cost-effectiveness analyses.

Governments employ benefit-cost analysis to ensure that their regulatory actions and investments in transportation infrastructure will use society's resources most efficiently and to promote transparency in decision-making. Doing so often requires assigning money values to factors that lack observable market prices. As one of the most important of these factors, travel time has been the subject of research in many countries over several decades. Individual experts and official panels have reviewed and summarized this literature repeatedly as it has grown, and this document draws on that body of research and interpretation to establish procedures for use in valuing travel time consistently throughout DOT.

These expert summaries represent only a rough consensus about relevant variables and relationships among values. Because VTTS varies widely, standard values for government decisions must ignore or simplify many important factors. A complete model of real travel choices would require a large number of variables and associated coefficients, yet there are no sources for most of these variables, and the coefficients estimated from available data vary between studies and are subject to considerable uncertainty and interpretation. Combining individual decisions to draw conclusions for an entire society implies subjective assumptions about the influence of incomes and other personal characteristics. Therefore, the object of this guidance must be seen as construction of a useful framework for assigning values to government actions, rather than distilling precise scientific conclusions from the literature or predicting travel behavior.

The initial Departmental guidance for the valuation of travel time in economic analysis was published on April 9, 1997, and the first tables of revised values were published on February 11, 2003. Part of the reason for the long intervals between revisions was that certain data were available only from private sources or updated infrequently. The resulting delay and lack of transparency was inconvenient, confusing, and a potential cause of economic inefficiency. Consequently, we revised our guidance in 2011 to derive VTTS from public and regularly published data that permits the Department to issue annual updates. We use median income levels, rather than means, as consistently as possible. We believe that this approach reflects the valuations of typical travelers in diverse populations more reliably and yields conclusions that are less sensitive to fluctuations in extreme values.

General concepts

The demand for travel is generally derived from the demand for activities it permits at either end of the trip, just as sporting equipment is valued only for participation in the complementary sport it permits. In contrast, travel time must be conceived as having a negative demand, a consumer's willingness to pay to have less of it. This too is derived, not from complements, but from substitutes, i.e., the time available for activities at origin or destination, which may vary greatly in their value and urgency. The value of time saved from travel will depend on the traveler, the circumstances of the trip, and the available transportation options. There can be no assurance in principle that these factors will be stable. A large share of individual trips, however, particularly commuting to work, have similar purposes and are repeated on daily and weekly schedules. By focusing on a few choices of mode and route (e.g., rail transit vs. private auto, toll highway vs. parallel free thoroughfare) researchers have approximated explanations of travelers' decisions with a manageable number of variables yet with some confidence that their conclusions can be applied to a reasonably large share of travel by the larger community.

The values so derived are broadly representative and practically useful for estimating social benefits—the purpose for which this guidance is intended. They cannot be used to predict the number of travelers who would choose a specific mode or route, however. Such predictions depend on the distribution of time values over the population, rather than the most common value, and on the number of travelers who are close to the margin in deciding between alternatives.

The value of reducing travel time expresses three principles. First, time saved from travel could be dedicated to production, yielding a monetary benefit to either travelers or their employers. Second, it could be spent in recreation or other enjoyable or necessary leisure activities, which individuals value and are thus willing to pay for. Third, the conditions of travel during part or all of a trip may be unpleasant and involve tension, fatigue, or discomfort. Reducing the time spent while exposed to such conditions may be more valuable than saving time on more comfortable portions of the trip. These principles underlie the distinctions among values recommended in this guidance.

Specific topics

Reliability

Closely associated with VTTS, reliability has long been viewed as a source of utility distinct from reduction of the expected trip time. If travelers are uncertain about travel time, they may include a "buffer" in their schedules, leaving early and sacrificing a certain amount of time at the origin to insure against a more costly delay in arriving at the destination. This insurance will be frequently unnecessary or excessive and occasionally inadequate. Alternatively, insuring against delay may mean choosing a more reliable route or mode with a slower expected speed and/or a higher monetary cost.

There are several ways to measure the travelers' experience and define their perception of future delay risks, including standard deviation of trip time; the difference or ratio between the median trip time and a higher percentile trip time (such as the 95th percentile); or the probability of

lateness beyond a fixed target. Furthermore, variation of travel time over some period will differ between origin-destination pairs, depending both on the reliability of travel on each trip segment and on the correlation of delays between segments.

Thus, a "value of reliability" is much more complex to estimate than an average VTTS, since it requires knowledge of the joint distribution of travel times and of the rates of change of value at the margins, rather than just the means. Studies have been conducted in several countries, using different measures of reliability, and suggestive results have been produced. Although it may be possible to derive estimates for specific cases, we are not yet prepared to provide guidance for routine valuation of reliability. In contrast to differences in reliability among modes or routes, however, improvements in reliability on a single route will often be linked to reductions in expected travel time, so that one possible approach is to add an allowance to VTTS to reflect the value of improved reliability.

Size of time change

Another subject of discussion has been whether VTTS should be ignored below some threshold increment of time saved. Some research has suggested the conclusion that discrete, small savings may have negligible benefits. See Australia Bureau of Transport Economics, Fosgerau *et al.*, Mackie *et al.* (2001, 2003).

There is no persuasive evidence of where such a threshold might be for any population or how it could be used to predict an appropriate threshold for another. A more important problem is that all changes in travel time resulting from government actions are composed of many smaller changes, and it would be impossible to identify particular changes considered large enough to affect each individual decision. To evaluate the aggregate impact of any action, therefore, we must assume that the value of each minute of saved time is constant, regardless of the total time required for a trip.

Value of Time in Freight Transportation

Most of the VTTS literature focuses on passenger travel, rather than freight transportation. Estimates have been made of the labor costs of freight vehicle operators (e.g., truck drivers or locomotive engineers) and of the operating costs of freight vehicles that would be affected by changes in travel time. The value of time to shippers (i.e., the owners of the freight that is being transported) cannot be estimated so easily, however. Because freight in transit represents unproductive capital that incurs an interest cost, part of the benefit of saved time will be proportional to the time saved, the interest rate, and the value of the freight. The principal obstacle to estimating this value is likely to be the heterogeneity and uncertainty of freight categories affected by any specific time saving. Each corridor or mode would thus require a specific estimate of the composition of freight carried. The cost of freight transportation time will also be influenced by factors independent of value, such as how quickly products become obsolete (because of fashion or technological obsolescence), whether the products spoil over time (as do agricultural commodities), and whether some production process is dependent upon timely delivery. Various reasons, then, explain why products may be "perishable" in the sense that their value declines appreciably while they are in transit. The cost to shippers may also depend on business practices, such as the amount of inventory kept on hand, and the likelihood of running out of inventory because of shipment delays.

The value of time in freight transportation is thus considerably more complex than is the case in passenger travel. Although we are not yet prepared to offer guidance on this issue, we are conducting research, and hope that additional information will permit concrete recommendations in the future.

Determinants of VTTS

Research into VTTS is conducted, not merely to understand the motives of travel decisions taken by the sampled individuals, but to estimate the influence of measurable factors on other groups, often remote in time and place. Each estimate depends on the demographic characteristics of the traveling population, the mode, time, location, and purpose of travel, and the menu of available alternatives, so the selected explanatory variables must be important for these decisions, practically observable or published, and also obtainable for new samples. Not all relevant factors can be controlled for in a single study or measured consistently for new studies or populations affected by government actions. Our object is therefore to express VTTS in terms of a limited number of variables that have been used in empirical research and are likely to be available for application in new analyses. The sources of variation will inevitably be simplified and distorted, but the result may be a realistic approximation. The variables discussed here are those that are most common in the primary research literature and have been found most useful for applied evaluations.

Trip purpose

The principal distinction in trip purpose is that between "on-the-clock" business travel time, for which a market wage is paid, and personal or leisure time allocated according to the traveler's preferences. In some cases, commuting is treated as a separate category, intermediate between personal and business, but more frequently it is included in personal travel. Research has typically found VTTS for personal travel to be lower than the hourly earning rate. This conclusion does not imply that leisure is less intrinsically desirable than paid work. In theory, a worker's hourly wage is equal to his marginal value of time, but with an institutionally fixed working day, this concept can be no better than an approximation. People who earn a salary may have few opportunities to convert saved time into added income, which they would have to do to equate VTTS on and off the clock. Inclusion of commuting in personal travel is consistent with the hypothesis of fixed hours for salaried work. Personal travel may also be undertaken to enjoy the passing scenery or the qualities of a particular mode: a sports car, cruise ship, or steam railroad. In such a case, VTTS could actually be negative, the individual being willing to pay to spend more time traveling along a particular route or via a particular mode.

In business travel, though it may seem paradoxical, the treatment of commercial drivers (whose travel time is spent working) and travelers who are unable to perform work *en route* should be identical. In either case, savings in travel time are made available for additional productive work. When work can be performed by passengers during travel by means of a laptop computer, a mobile telephone, documents on paper, or discussion among travelers, time savings may increase productivity only slightly, if at all, implying a lower VTTS.

Personal characteristics

Demographic variables such as age, sex, education, and employment are widely incorporated as explanatory variables in social and economic research and may well influence VTTS. While they are sometimes included in empirical studies, they are unlikely to be practical for appraising the impact of government actions. More closely associated with VTTS are the distinctions between drivers and passengers and between parents and children. Clearly, in a public transit vehicle or a car pool, each passenger may have an independent value of time, and the value of increasing the speed of the trip can be conceived as the sum of values for individual vehicle occupants. In private vehicles, the case is more ambiguous. Adult or child passengers may be "along for the ride" and have no pressing business that would influence the driver's decisions. Alternatively, the driver's motive for speeding up travel may be altruistic or joint with the passengers' (rushing a child to the emergency room or a group to a show). Without the possibility of distinguishing the composition or motives of ridership, it must be assumed that all travelers' VTTS are independent and additive.

Hourly income

In theory, hourly income influences VTTS through two channels. The simplest model evaluates savings in paid business travel time. While workers are assumed to be indifferent between travel and other ways to spend time for which they are compensated, employers perceive their employees' gross compensation (including payroll taxes and fringe benefits) as the value of the productivity sacrificed to travel. In general practice, VTTS for business-related travel is not estimated empirically but is defined by the gross compensation.

VTTS for personal travel lacks such a theoretical formulation, and leisure time is seen instead as an object of consumption that can be substituted for other desirable objects according to individual preferences. In general, VTTS is estimated to be lower for personal than for business travel. See Mackie *et al.* (2001).
Suggested reasons include:

- Employers' compensation costs include taxes and benefits excluded from workers' disposable income;
- Working hours are typically fixed by employers, preventing workers from earning more by saving personal travel time;
- Compensation is spread over several family members, including non-earners.

While such rationales are plausible, circumstances may dictate high or low willingness to pay for faster travel by either working travelers or dependents, and only empirical research can yield quantitative estimates. Neither specifying a model of household travel decisions nor obtaining the appropriate data for estimation is a straightforward process. Households include varied numbers of earners and dependents for whom work, school, child care, and other demands on time and income may influence VTTS in unknown ways. Travel by families incurs joint costs of lost time that cannot be assigned to particular members. Besides compensation, unearned income from investments or annuities contributes to travel budgets. Among all of these factors, the compensation level of an individual traveler may not be the most important or the most accessible variable. Research tends to use either a few broad household income bands stated by

sampled travelers or the median household incomes of the geographic areas studied. See, *e.g.*, Asensio and Matas (2008) and Small *et al.* (2005).

To adjust past estimates for application to new populations, we require income measures that are nationwide, comparable and stable in definition, and regularly updated and published. The most reliable variable for projecting business VTTS is the median hourly wage for all occupations. Since median fringe benefits are not published, the median wage can be scaled upward to approximate the median gross compensation by multiplying by the ratio of mean gross compensation (including fringe benefits and payroll taxes) to mean money wages. The best variable for projecting personal VTTS is annual median household income. In order to present business and personal VTTS on a

practical and comparable basis, annual household income is scaled to an hourly rate by dividing by 2,080 hours per year, although it should not be inferred that travelers prorate their household incomes by the hour to make decisions.

In using hourly income as a scaling factor to transfer VTTS estimates to new times and locations it has been common to assume an income elasticity of 1.0 (a one percent increase in VTTS per one percent increase in income), implying a constant proportional relationship. Some recent studies have yielded lower elasticities for personal travel, although they have not been unchallenged. Such studies tend to be based on cross-sectional models, which compare travelers of different incomes at the same time and location. Apart from the credibility of particular results, the assumption that parameters derived from cross-section studies are valid for time series is problematic. Furthermore, use of non-unitary income elasticities would raise a serious question. If VTTS for business travel is defined as equal to the cost of employment, it must display a unitary elasticity, growing at the same rate as growing incomes, while VTTS in personal travel, with a smaller elasticity, would display slower growth. As a result, an ever-larger discrepancy would emerge between VTTS for business and personal travel, negating the hypothesis of a stable ratio between them. VTTS could then be defined only for the period of each study and extrapolated to the present or the future only by complex and arbitrary calculations. Instead, we retain the assumption of fixed VTTS relationships for different trip purposes and an income elasticity of 1.0 for all.

Where travelers of distinct income levels use modes that are not close substitutes, VTTS may be associated with an expected income for each mode. If there are wide and overlapping income ranges in substitutable modes, it is preferable not to differentiate VTTS estimates on the basis of travelers' incomes but to use a single value for all.

Mode and distance

VTTS research is often based on the factors influencing mode choice, including the comfort, privacy, and prestige subjectively ascribed to particular modes, as well as travel time and cost. Since the conclusions of this research are used primarily to evaluate time and cost benefits, analysts must control for the other factors affecting mode choice. The question remains whether differences among modes in VTTS are systematic or are accidents of specification and the data used. For example, should VTTS differ between auto drivers and bus passengers after other factors are taken into account? Should income differences between the groups be assumed to

affect the comparative benefits of time savings? As indicated above, where modes are relatively close substitutes in location, purpose, and trip distance, it is appropriate to assume that the incomes and preferences of travelers are distributed identically among and within modes, yielding a common VTTS.

While this uniformity is appropriate among local modes, research has found evidence of a moderate rise in VTTS with trip distance. This tendency may be seen as a consequence of the limited amount of time available for taking a long trip. In addition, it may reflect the high value of time at destinations which justify increased costs of travel and complementary food and lodging. Although some governments have derived VTTS from an estimated distance elasticity, this is an awkward parameter to use, requiring a specific distance for each application, whereas a route segment or mode affected by a government action is likely to support trips of widely varying distance. A more practical approach differentiates trips by broad categories of local travel (i.e., within a metropolitan area) and intercity travel (for trips over 50 miles).

Certain modes, particularly airlines and high-speed railways, are not close substitutes for conventional surface modes. (High-speed railways are associated with the Core Express Corridors defined in the FRA National Rail Plan as connecting large urban areas up to 500 miles apart with 2-3 hour travel time and speeds between 125 and 250 mph.) Since these modes charge higher fares to travelers who place a greater value on time saving, it is reasonable to derive a distinct VTTS from the higher incomes of their passengers. Although income information on travelers in these markets is limited in detail, estimates from the 2001 National Household Travel Survey of the household incomes of air passengers on personal and business trips permit construction of expected VTTS specific to air travel. Because high-speed rail will often compete with air travel for similar consumers, the same VTTS is applied to both modes.

Comfort

Travelers will vary widely in willingness to pay to shorten the time during which they are subject to uncomfortable conditions such as walking, bicycling, and standing on platforms or in vehicles. Indeed, many other conditions—stressful driving in heavy traffic, exposure to weather, crowding, uncomfortable seating, and lack of personal security—could be included in this list, but it would be difficult to assign values to all of them or measure their severity and duration. VTTS estimates already incorporate assumptions about such conditions. Since shortening walking distances and waiting times and increasing seating are routine options in transportation planning, we assign values to their benefits. A distinction should be noted between actions that shorten the time period during which such conditions are experienced (reducing waiting by more frequent train service) and those that improve conditions during the whole trip (adding cars to permit more passengers to be seated). In the former case, VTTS is fixed at a higher level while the travel time varies; in the latter, travel time is constant, but VTTS varies.

Research and syntheses

The appended bibliography compiles references, accessible via the Internet, that demonstrate the evolution of theoretical and empirical research into VTTS and contain even more comprehensive lists of sources. These include reviews of the research literature and recommended guidance for government agencies in the U.S. and abroad. The history of the economic theory of time valuation is discussed in Mackie *et al.* (2001) and more formally in Jara-Díaz and Guevara (1999). The pioneering articles by Becker (1965) and DeSerpa (1971) place time-allocation

decisions in a context of consumption choice based on utility maximization, subject to constraints on income and the minimum amount of time required by each activity. With its subsequent extensions, this model permits derivation of equilibrium conditions for time allocation and has provided a widely-used basis for estimation of the parameters of VTTS.

Analysts have employed various techniques for estimating travelers' willingness to pay to save time. Where behavioral patterns such as choice of route or mode can be observed and other causal factors can be controlled for, estimates are derived from revealed preference. More frequently, stated preference methods are employed, using questionnaires to elicit hypothetical choices among trips that vary across several dimensions. This approach allows consideration of a greater number of behavioral alternatives and independent variables. Although revealed preference studies observe actual consumer choices, they are subject to error in the specification and measurement of the explanatory variables. Stated preference studies, in contrast, specify explanatory variables precisely but may be subject to errors when respondents predict their own hypothetical behavior unrealistically. Recent research has also combined these methods, using questionnaires to elicit information on the factors influencing real travel choices. Most research employs discrete choice techniques such as logit analysis to estimate the parameters influencing preference for specific modes or routes. As the number of published studies has grown, some investigators have also used meta-analysis to estimate the causes of variation among the conclusions of separate investigations.

Although VTTS was first investigated in English-speaking countries, concerted efforts to develop national models based on systematic data collection have been undertaken in the Netherlands, Switzerland, and the Scandinavian countries, as well as the United Kingdom (U.K.). VTTS has also been the object of research in Latin America and Asia. While several of these studies are cited in the bibliography, we will not analyze all of their conclusions.

There is wide agreement that the VTTS for business travel should equal the gross hourly cost of employment, including payroll taxes and fringe benefits. Because of international differences in tax structures, labor markets, data resources, and analysts' view of the social groups being studied, however, the definition of hourly income varies. In theory, it is equal to the worker's marginal product that would be sacrificed if travel were slower. Productivity may vary during work hours, allowing travel to be scheduled to minimize losses and, as noted earlier, modern technology can combine work with travel. Still, there is no well-accepted basis for estimating how the generalized value of business travel time differs from the simple gross compensation or predicting its variation in applied evaluation. All of the cited syntheses adopt the assumption that business travel time is equal to gross compensation, except for Boiteux and Baumstark (2001), where VTTS on business is estimated at 61 percent of the hourly cost of employment or 85 percent of the employee's gross salary (relating to the French system of accounts). Whether the earnings to which estimates are applied should be averages over broad or narrow groups (defined by mode, driver/passenger, or type of employment) is often unclear.

For personal travel, the range of recommended values is broader, reflecting the absence of a theoretically compelling hypothesis. Some studies find lower VTTS for auto passengers than for drivers and lower values for shopping or recreational travel than for commuting. Application of such distinctions, even if consistently supported by research, would require data on the specific

characteristics and travel purposes of the population affected by government actions. To suggest the values developed in other countries, the following table converts VTTS for commuting auto drivers recommended in several European studies to dollars of the same years as the estimates and projects them to 2008 dollars by the growth in U.S. median household income. These values span a range that is significant but not so wide as to suggest major specification errors or other inconsistencies. It may be observed that the values we now recommend are near the center of this distribution.

Commuter VTTS

Country	Year	VTTS in $/hr.	US income growth to 2008	Equivalent 2008 VTTS
Denmark	2004	$10.98	1.13	$12.46
France	1998	$10.26	1.29	$13.27
Norway	1995	$6.32	1.48	$9.33
Spain	2005	$17.06	1.09	$18.52
Sweden	1994	$4.34	1.56	$6.77
Switzerland	2003	$15.85	1.16	$18.41
UK	2002	$7.71	1.19	$9.15

The U.K. practice, as seen in Mackie *et al.* (2003) and in the U.K.'s Transport Analysis Guidance (TAG) 3.5.6 (the official guidance which Mackie's work informs), is to distinguish modes by mean income but not by distance. VTTS for commuting is set at less than 25 percent of the average for business travel and VTTS for other purposes at 90 percent of the commuting rate. Gwilliam suggests that the World Bank use values of 30 percent of household income per hour for adults and 15 percent for children. Boiteux also recommends 30 percent of total employment cost per hour or 42 percent of gross wages (50 percent of the VTTS on business). The value grows with distance at a rate that diminishes by distance bands. Austroads (the association of Australian and New Zealand road transport and traffic authorities) recognizes a range of 30 to 60 percent of average earnings and suggests a standard of 40 percent. Both Concas and Kolpakov and Zhang *et al.* recommend a rate of 50 percent of the national average wage for both commuting and other personal trips. Boiteux and Baumstark, Mackie *et al.* (2003), and Zhang *et al.* all recommend explicit use of income elasticities of personal VTTS over time: 0.7, 0.8, and 0.75, respectively.

Concas and Kolpakov assign a value of only 35 percent of the wage for reducing seated riding time on transit vehicles but value standing at 100 percent and waiting under unpleasant conditions at up to 175 percent of the wage. Boiteux recommends increasing the VTTS in urban transit by 50 percent in crowded conditions and by 100 percent for walking or waiting. Gwilliam approves a 50-percent increase for both walking and waiting. Both TAG 3.5.6 and Zhang *et al.* prescribe a VTTS twice the normal value for walking or bicycling and 2.5 times the normal value when waiting.

In sum, there is a broad consensus on the approach adopted and the relevant variables and categories, as well as a degree of similarity in the specific values recommended. Still, neither the findings of research nor the judgments of expert panels are sufficiently uniform to eliminate arbitrariness.

Values for DOT applications

All studies have acknowledged the necessity of simplifying the many occasions and determinants of VTTS into a tractable system corresponding to the information available on the sources and targets of valuation. The structure of values that we adopted in 1997 is broadly consistent with those employed in other countries, and it continues to be useful for evaluation of the costs and benefits of government investments or regulations. As stated in the introduction, it is not specific enough to predict travelers' demand for particular modes or routes. In the following tables, the proportions of VTTS to income for personal vs. business, local vs. intercity, and surface vs. air travel are unchanged from our initial guidance of 1997, except for the association of high-speed rail with air travel, rather than with conventional surface modes. Similarly, the ranges of high and low proportions for conceptual testing are identical. Although valuing local personal travel at 50 percent of hourly income and intercity travel at 70 percent places our estimate among the higher ones examined, it is not beyond the range estimated in several studies and commonly viewed as reasonable.

The principal changes that we adopted in 2011 were the sources of income data to which these proportions are applied. We use data exclusively from Federal government sources and median income values whenever possible, considering them more representative of the incomes of typical travelers than the means. We present separate VTTS estimates for different categories of transportation vehicle operators, which can be used together with passenger VTTS to derive the benefits to vehicle occupants or combined with estimates of freight time value from other sources to derive the benefits of time savings in freight shipment. We also calculate hourly values as annual values divided by 2,080, rather than 2,000, for the sake of consistency with the wage figures published by the Bureau of Labor Statistics (BLS).

Categories of VTTS

The ratios of VTTS to hourly incomes in Tables 1 and 2, expressed as percentages, must be multiplied by appropriate income estimates to convert them to dollar values. These estimates are shown in Table 3, and the resulting VTTS estimates appear in Table 4. The appropriate ranges of VTTS for comparison of alternative estimates are shown in Table 5.

The tables present additional rows of "all purposes" values; these are weighted averages of the values prescribed for personal and business travel with weights derived from the 2001 NHTS. Although person-miles of travel are used to weight the surface modes, person-trips are more appropriate for air travel because many government actions that change air travel time will be independent of trip length.
The distributions so derived are:

- Local travel by surface modes: 95.4% personal, 4.6% business;
- Intercity travel by surface modes: 78.6% personal, 21.4% business;

- Intercity travel by air: 59.6% personal, 40.4% business.

Business travel

For "on-the-clock" business travelers over all distances and by every surface mode, VTTS is assumed to be equal to a nationwide median gross compensation, defined as the sum of the median hourly wage and an estimate of hourly benefits.

Median wages are obtained from the BLS National Occupational Employment and Wage Estimates. The updated (May 2015) value for this figure is $17.40 per hour. Median benefits are not available from this source; instead, they are approximated by taking the ratio of average total compensation (including fringe benefits) to average wages in the Employer Costs for Employee Compensation series and applying it to median wages. Based on BLS data for June 2015, this ratio is 1.46. This extrapolation is performed for business travelers on all modes, using the share of benefits for all workers. This procedure generates a VTTS estimate of $25.40 for general business travel.

For vehicle operators (including truck drivers, bus drivers, transit rail operators, locomotive engineers, and airline pilots and engineers), the benefit share applied is derived from the series for transportation and material moving occupations; the ratio derived from BLS data for these occupations is 1.54 in June 2015. Truck drivers' wages are estimated for a weighted average of heavy and light truck drivers from the National Occupational Employment and Wage Estimates.

In the case of air and high-speed rail travel, high-cost modes used for fast trips over long distances, we conclude that use of a distinct wage is justified. The best source for incomes of air travelers is the BTS National Household Travel Survey of 2001 (no long-distance travel survey has been conducted since then), which permits estimation of distributions of household money income by trip purpose. The ratio of 2001 median household income of business air travelers (approximately $105,000) to the U.S. Census Bureau 2001 median household income ($42,228) yield a factor of 2.5 to be multiplied by the gross median compensation estimate for surface business travelers. Recent confidential survey data suggest that income levels for high-speed rail travelers are similar to those for air travelers, so we apply the same VTTS to high-speed rail travelers. Applying the 2.5 factor to the value for general business travel yields a VTTS for air and high-speed rail travel of $63.20.

Personal travel

For local personal travel, VTTS is estimated at 50 percent of hourly median household income. The nationwide median annual household income, $56,516 in 2015, is divided by 2,080 to yield an income of $27.20 per hour. The local VTTS is thus $13.60. We distinguish local from intercity personal travel, estimating a VTTS that rises with distance. For the latter purpose, we have adopted a ratio of VTTS to hourly income of 70 percent. The VTTS for intercity personal surface travel is then $19.00 per hour.

For personal travel by air or high-speed rail, the above estimate of VTTS for personal intercity surface travel is multiplied by 1.9, the ratio from the NHTS of the 2001 median household income of air travelers on personal business to the nationwide median household income in

2001. Updating median household income with 2015 information from the US Census Bureau yields a VTTS estimate of $36.10.

Special issues

In application, vehicle-hours are to be converted to person-hours by multiplying by average passenger occupancy of vehicles. Although riders may be a family with a joint VTTS or passengers in a car pool or transit vehicle with independent values, these circumstances can seldom be distinguished. Therefore, all individuals are assumed to have independent values.

Except for specific distinctions, we consider it inappropriate to use different income levels or sources for different categories of traveler. Neither the incomes associated with published research nor the stability of the relationship between income and VTTS are certain enough to imply that fine adjustments would yield more realistic estimates. The first distinction we recognize is that between personal and business (on-the-clock) travel; the second is that between surface travel by conventional modes and travel by air or high-speed rail. While VTTS for business travel is correlated with an estimate of passengers' employment compensation, for vehicle operators on several modes we have provided VTTS estimates based on median compensation data by employment category as reported by the Bureau of Labor Statistics. The scale of income levels developed here is applicable nationwide, and analysts should not attempt to substitute incomes for particular modes or locations. Nevertheless, estimates derived by reliable and focused research may be superior for predicting behavioral responses in specific cases.

Personal time spent walking or waiting outside of vehicles, as well as time spent standing in vehicles or bicycling, should be evaluated at 100 percent of hourly income, with a range of 80 to 120 percent to reflect uncertainty. As stated above, reducing the time during which uncomfortable conditions are experienced provides a benefit equal to the product of this VTTS and the reduction in time, while the benefit of improved travel conditions (such as additional seating) is equal to the product of the difference in VTTS (50 percent of hourly income) and the total time during which discomfort would have been experienced.

Uncertainty in the recommended values

The ratios in Table 1 represent the best single figures for defining VTTS as a fraction of hourly income. These figures, like all parameters of travel behavior, are subject to uncertainty. Table 2 summarizes a plausible range for each trip category, not necessarily symmetric about the point estimates in Table 1. The corresponding high and low dollar estimates are shown in Table 5. In addition to evaluations based on the most likely estimates, alternative calculations using these ranges should be presented to test the sensitivity of analyses to potential errors in estimation.

Updating the estimated values

The Office of the Assistant Secretary for Transportation Policy will publish annual updates of VTTS to reflect growth in hourly incomes, using the data sources cited above. No updating of the percentages developed in Tables 1 and 2 is required. We will monitor and interpret available research on travel behavior and issue new guidance as appropriate.

Table 1 (Revision 2 – 2016 Update)

Recommended Values of Travel Time Savings (per person-hour as a percentage of total earnings)		
Category	**Surface Modes* (except High-Speed Rail)**	**Air and High-Speed Rail Travel**
Local Travel -		
Personal	50%	--
Business	100%	--
Intercity Travel -		
Personal	70%	70%
Business	100%	100%

Vehicle operators- 100% on all modes

* Surface figures apply to all combinations of in-vehicle and other time. Walk access, waiting, and transfer time should be valued at 100% of hourly income when actions affect only those elements of travel time.

Table 2 (Revision 2 – 2016 Update)

Plausible Ranges for Values of Travel Time Savings (per person-hour as a percentage of total earnings)		
Category	**Surface Modes*** (except High-Speed Rail)	**Air and High-Speed Rail Travel**
Local Travel -		
Personal	35% - 60%	--
Business	80% - 120%	--
Intercity Travel-		
Personal	60% - 90%	60% - 90%
Business	80% - 120%	80% - 120%

Vehicle operators- 80%-120% on all modes

* Surface figures apply to all combinations of in-vehicle and other transit time. Walk access, waiting, and transfer time should be valued at 80%-120% of hourly income when actions affect only those elements of travel time.

Table 3 (Revision 2 – 2016 Update)

Recommended Hourly Earnings Rates for Determining Values of Travel Time Savings (2015 U.S. $ per person-hour)		
Category	**Surface Modes (except High-Speed Rail)**	**Air and High-Speed Rail Travel**
Local Travel -		
Personal	$27.20	
Business	$25.40	
Intercity Travel -		
Personal	$27.20	$36.10
Business	$25.40	$63.20

Truck Drivers	$27.20
Bus Drivers	$28.30
Transit Rail Operators	$46.10
Locomotive engineers	$41.60
Airline Pilots and Engineers	$86.70

Table 3 (Revision 2, continued)

Sources:

(1) Local and intercity personal travel by conventional surface modes: median income for all U.S. households in 2015 ($56,516), reported in U.S. Census Bureau, Table H-8. Median Household Income by State: 1984 to 2015, divided by 2,080 hours per year.
http://www.census.gov/hhes/www/income/data/historical/household/

(2) Local and intercity business travel by conventional surface modes: Bureau of Labor Statistics, May 2015 Occupational Employment and Wage Estimates, median wage for all occupations, http://www.bls.gov/oes/current/oes_nat.htm multiplied by the ratio of mean total compensation to mean wage from BLS Employer Costs for Employee Compensation, 2nd Quarter 2015,
http://www.bls.gov/ncs/ect/sp/ececqrtn.pdf

(3) Intercity personal travel by air or high-speed rail: median hourly household income from (1), multiplied by 1.9.
Intercity business travel by air or high-speed rail: median hourly household income from (1), multiplied by 2.5 and by the ratio of median national employee compensation to median household income.

(4) Truck Drivers: weighted average of May 2015 median hourly wages of heavy- and light-truck drivers ($17.71) from BLS National Occupational Employment and Wage Estimates; expanded to total compensation by the ratio of total compensation to wages for transportation and material moving occupations from the 2015 Employer Cost for Employee Compensation series.
http://stats.bls.gov/oes/current/oes_nat.htm#b53-0000

Other vehicle operators: May 2015 median hourly wages from BLS National Occupational Employment and Wage Estimates; expanded to total compensation by the ratio of total compensation to wages for transportation and material moving occupations from the 2015 Employer Cost for Employee Compensation series.

Table 4 (Revision 2 – 2016 Update)

Recommended Hourly Values of Travel Time Savings (2015 U.S. $ per person-hour)		
Category	**Surface Modes* (except High-Speed Rail)**	**Air and High-Speed Rail Travel**
Local Travel-		
Personal	$13.60	
Business	$25.40	
All Purposes **	$14.10	
Intercity Travel -		
Personal	$19.00	$36.10
Business	$25.40	$63.20
All Purposes **	$20.40	$47.10

Truck Drivers	$27.20
Bus Drivers	$28.30
Transit Rail Operators	$46.10
Locomotive engineers	$41.60
Airline Pilots and Engineers	$86.70

Table 4 (Revision 2, continued)

* Surface figures apply to all combinations of in-vehicle and other time. Walk access, waiting, transfer, and standing time should be valued at $27.20 per hour for personal travel when actions affect only those elements of travel time.

** Weighted averages, using distributions of travel by trip purpose on various modes. Distribution for local travel by surface modes: 95.4% personal, 4.6% business. Distribution for intercity travel by conventional surface modes: 78.6% personal, 21.4% business. Distribution for intercity travel by air or high-speed rail: 59.6% personal, 40.4% business. Surface figures derived using annual person-mile (PMT) data from the 2001 National Household Travel Survey. http://nhts.ornl.gov/. Air figures use person-trip data.

Table 5 (Revision 2 - corrected)

Plausible Ranges for Hourly Values of Travel Time Savings (2015 U.S. $ per person-hour)				
Category	**Surface Modes* (except High-Speed Rail)**		**Air and High-Speed Rail Travel**	
	Low	High	Low	High
Local Travel-				
Personal	$9.50	$16.30	--	--
Business	$20.30	$30.50	--	--
All Purposes **	$10.00	$17.00	--	--
Intercity Travel -				
Personal	$16.30	$24.50	$31.00	$46.50
Business	$20.30	$30.50	$50.60	$75.80
All Purposes **	$17.20	$25.80	$38.90	$58.30

	Low	High
Truck Drivers	$21.80	$32.70
Bus Drivers	$22.70	$34.00
Transit Rail Operators	$36.90	$55.30
Locomotive engineers	$33.30	$49.90
Airline Pilots and Engineers	$69.40	$104.10

Table 5 (Revision 2, continued)

* Surface figures apply to all combinations of in-vehicle and other transit time. Walk access, waiting, and transfer time in personal travel should be valued at $21.70 - $32.60 per hour when actions affect only those elements of travel time.

** Weighted averages, using distributions of travel by trip purpose on various modes. Distribution for local travel by surface modes: 95.4% personal, 4.6% business. Distribution for intercity travel by conventional surface modes: 78.6% personal, 21.4% business. Distribution for intercity travel by air or high-speed rail: 59.6% personal, 40.4% business. Surface figures derived using annual person-mile (PMT) data from the 2001 National Household Travel Survey. http://nhts.ornl.gov/. Air figures use person-trip data.

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U.S. General Services Administration

POV Mileage Rates (Archived)

Previous Airplane Reimbursement Rates

Previous Motorcycle Reimbursement Rates

Previous Automobile Reimbursement Rates

Previous Automobile Reimbursement Rates when Government-Owned Autos are Available

The following are previous mileage reimbursement rates for airplanes:

Previous airplane rates

Effective Dates	Rate Per mile
January 1, 2018	$1.21
January 1, 2017	$1.15
January 1, 2016	$1.17
January 1, 2015	$1.29
January 1, 2014	$1.31
January 1, 2013	$1.33
April 17, 2012	$1.31
January 1, 2011	$1.29
January 1, 2010	$1.29
January 1, 2009	$1.24

The following are previous mileage reimbursement rates for motorcycles :

Previous motorcycle rates

Effective dates	Rate per mile
January 1, 2018	$0.515
January 1, 2017	$0.505
January 1, 2016	$0.51
January 1, 2015	$0.545
January 1, 2014	$0.53
January 1, 2013	$0.535
April 17, 2012	$0.525
January 1, 2011	$0.48
January 1, 2010	$0.47
January 1, 2009	$0.52

The following are previous privately owned automobile rates:

Previous automobile rates

Effective Date	Rate per mile
January 1, 2018	$0.545
January 1, 2017	$0.535
January 1, 2016	$0.54
January 1, 2015	$0.575
January 1, 2014	$0.56

Effective Date	Rate per mile
January 1, 2013	$0.565
April 17, 2012	$0.555
January 1, 2011	$0.51
January 1, 2010	$0.50
January 1, 2009	$0.55
August 1, 2008	$0.585
March 19, 2008	$0.505
February 1, 2007	$0.485
January 1, 2006	$0.445
September 1, 2005	$0.485
February 4, 2005	$0.405
January 1, 2004	$0.375
January 1, 2003	$0.360
January 21, 2002	$0.365
January 22, 2001	$0.345
January 14, 2000	$0.325
April 1, 1999	$0.31
September 8, 1998	$0.325
June 7, 1996	$0.31
January 1, 1995	$0.30

The following are Previous Automobile Reimbursement Rates when Government-Furnished Autos are Available:

Previous Government-Furnished Auto rates

Effective Date	Rate per mile
January 1, 2018	$0.18
January 1, 2017	$0.17
January 1, 2016	$0.19
January 1, 2015	$0.23
January 1, 2014	$0.235
January 1, 2013	$0.24
April 17, 2012	$0.23
January 1, 2011	$0.19
January 1, 2005	$0.285

QUESTIONS:
For all travel policy questions, e-mail travelpolicy@gsa.gov

QUESTIONS
For all travel policy questions, email travelpolicy@gsa.gov.

TAX FOUNDATION

State and Local Sales Tax Rates in 2017

January 31, 2017

Jared Walczak, Scott Drenkard

Key Findings

- Forty-five states and the District of Columbia collect statewide sales taxes.
- Local sales taxes are collected in 38 states.
- The five states with the highest average combined state and local sales tax rates are Louisiana (9.98 percent), Tennessee (9.46 percent), Arkansas (9.30 percent), Alabama (9.01 percent), and Washington (8.92 percent).
- Sales tax rates differ by state, but sales tax bases also impact how much revenue is collected from a tax and how the tax affects the economy.
- Sales tax rate differentials can induce consumers to shop across borders or buy products online.

Introduction

Retail sales taxes are one of the more transparent ways to collect tax revenue. While graduated income tax rates and brackets are complex and confusing to many taxpayers, sales taxes are easier to understand; consumers can see their tax burden printed directly on their receipts.

In addition to state-level sales taxes, consumers also face local sales taxes in 38 states. These rates can be substantial, so a state with a moderate statewide sales tax rate could actually have a very high combined state and local rate compared to other states. This report provides a population-weighted average of local sales taxes as of January 1, 2017, in an attempt to give a sense of the average local rate for each state. Table 1 provides a full state-by-state listing of state and local sales tax rates.

Combined Rates

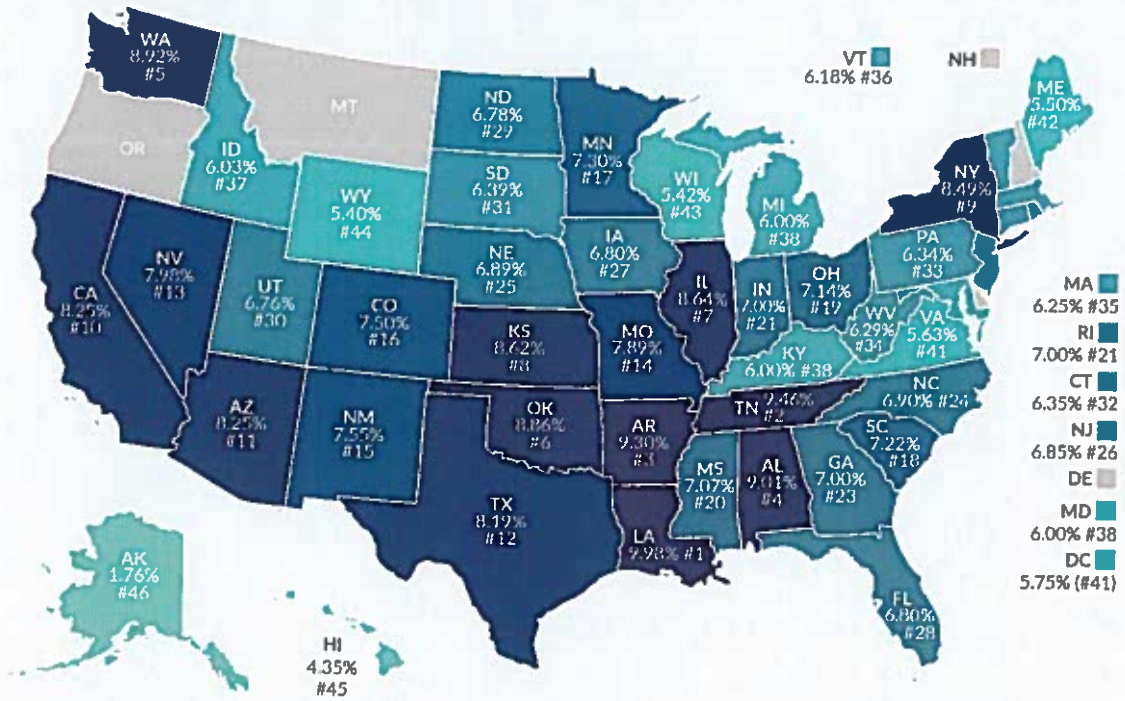
Five states do not have statewide sales taxes: Alaska, Delaware, Montana, New Hampshire, and Oregon. Of these, Alaska and Montana allow localities to charge local sales taxes.[1]

The five states with the highest average combined state and local sales tax rates are Louisiana (9.98 percent), Tennessee (9.46 percent), Arkansas (9.30 percent), Alabama (9.01 percent), and Washington (8.92 percent).

The five states with the lowest average combined rates are Alaska (1.76 percent), Hawaii (4.35 percent), Wyoming (5.40 percent), Wisconsin (5.42 percent), and Maine (5.5 percent).

How High Are Sales Taxes in Your State?

Combined State & Average Local Sales Tax Rates, Jan. 1 2017



Note: City, county and municipal rates vary. These rates are weighted by population to compute an average local tax rate. Three states levy mandatory, statewide, local add-on sales taxes at the state level: California (1%), Utah (1.25%), Virginia (1%), we include these in their state sales tax. The sales taxes in Hawaii, New Mexico and South Dakota have broad bases that include many services. Due to data limitations, table does not include sales taxes in local resort areas in Montana. Salem County is not subject to the statewide sales tax rate and collects a local rate of 3.4375%. New Jersey's average local score is represented as a negative.

Source: Sales Tax Clearinghouse, Tax Foundation calculations, State Revenue Department Websites

Combined Sales Tax Rate

Lower — Higher

TAX FOUNDATION @TaxFoundation

State Rates

California has the highest state-level sales tax rate, at 7.25 percent.[2] Four states tie for the second-highest statewide rate, at 7 percent: Indiana, Mississippi, Rhode Island, and Tennessee. The lowest non-zero, state-level sales tax is in Colorado, which has a rate of 2.9 percent. Five states follow with 4 percent rates: Alabama, Georgia, Hawaii, New York, and Wyoming.[3]

While still the highest state sales tax rate in the nation, California's state rate did decrease slightly, from 7.5 percent to 7.25 percent, due to the expiration of Proposition 30.[4] Elsewhere, New Jersey's state sales tax rate fell from 7 percent to 6.875 percent as part of

a broader tax reform package which also increased the state's motor fuel tax and began phasing out the estate tax. The state sales tax is scheduled to decline further to 6.625 percent in 2018.[5] No other states changed their state-level sales tax in January.

Local Rates

The five states with the highest average local sales tax rates are Alabama (5.01 percent), Louisiana (4.98 percent), Colorado (4.60 percent), New York (4.49 percent), and Oklahoma (4.36 percent). Voters in several California cities and counties approved ballot measures increasing local sales tax rates to increase funding for transportation and law enforcement. For instance, San Jose's combined state and local sales tax rate now stands at 8.75 percent following an October 2016 tax increase, with the rate set to rise further to 9.25 percent when Santa Clara County, of which it is the county seat, initiates its own voter-approved transportation tax increase this April.[6]

The border county of Salem County, New Jersey, is exempt from collecting the 6.875 percent statewide sales tax and instead collects a 3.4375 percent (half-rate) tax, a policy designed to help local retailers compete with neighboring Delaware, which foregoes a sales tax. We represent this anomaly as a negative 0.03 percent statewide average local rate (adjusting for population as described in the methodology section below), and the combined rate reflects this subtraction. Despite the slightly favorable impact on the overall rate, this lower rate represents an implicit acknowledgment by New Jersey officials that their 6.875 percent statewide rate is uncompetitive with neighboring Delaware, which has no sales tax.

State and Local Sales Tax Rates as of January 1, 2017

State	State Tax Rate	Rank	Avg. Local Tax Rate (a)	Combined Rate	Combined Rank	Max Local Tax Rate
Alabama	4.00%	40	5.01%	9.01%	4	7.00%
Alaska	0.00%	46	1.76%	1.76%	46	7.50%
Arizona	5.60%	28	2.65%	8.25%	11	5.30%
Arkansas	6.50%	9	2.80%	9.30%	3	5.125%
California (b)	7.25%	1	1.00%	8.25%	10	2.50%
Colorado	2.90%	45	4.60%	7.50%	16	8.30%
Connecticut	6.35%	12	0.00%	6.35%	32	0.00%
Delaware	0.00%	46	0.00%	0.00%	47	0.00%
Florida	6.00%	16	0.80%	6.80%	28	2.00%
Georgia	4.00%	40	3.00%	7.00%	23	4.00%
Hawaii (c)	4.00%	40	0.35%	4.35%	45	0.50%
Idaho	6.00%	16	0.03%	6.03%	37	3.00%
Illinois	6.25%	13	2.39%	8.64%	7	4.75%
Indiana	7.00%	2	0.00%	7.00%	21	0.00%
Iowa	6.00%	16	0.80%	6.80%	27	1.00%
Kansas	6.50%	9	2.12%	8.62%	8	4.00%
Kentucky	6.00%	16	0.00%	6.00%	38	0.00%
Louisiana	5.00%	33	4.98%	9.98%	1	7.00%

(a) City, county and municipal rates vary. These rates are weighted by population to compute an average local tax rate.
(b) Three states levy mandatory statewide local add-on sales taxes at the state level. California (1.25%), Utah (1.25%), Virginia (1%), we include these in their state sales tax.
(c) The sales taxes in Hawaii, New Mexico and South Dakota have broad bases that include many services.
(d) Due to data limitations, table does not include sales taxes in local resort areas in Montana.
(e) Salem County is not subject to the statewide sales tax rate and collects a local rate of 3.4375%. New Jersey's average local score is represented as a negative.
Sources: Sales Tax Clearinghouse; Tax Foundation calculations; State Revenue Department websites.

State	State Tax Rate	Rank	Avg. Local Tax Rate (a)	Combined Rate	Combined Rank	Max Local Tax Rate
Maine	5.50%	29	0.00%	5.50%	42	0.00%
Maryland	6.00%	16	0.00%	6.00%	38	0.00%
Massachusetts	6.25%	13	0.00%	6.25%	35	0.00%
Michigan	6.00%	16	0.00%	6.00%	38	0.00%
Minnesota	6.875%	6	0.42%	7.30%	17	1.50%
Mississippi	7.00%	2	0.07%	7.07%	20	1.00%
Missouri	4.225%	39	3.66%	7.89%	14	5.00%
Montana (d)	0.00%	46	0.00%	0.00%	47	0.00%
Nebraska	5.50%	29	1.39%	6.89%	25	2.00%
Nevada	6.85%	8	1.13%	7.98%	13	1.30%
New Hampshire	0.00%	46	0.00%	0.00%	47	0.00%
New Jersey (e)	6.875%	6	-0.03%	6.85%	26	0.00%
New Mexico (c)	5.125%	32	2.43%	7.55%	15	3.5625%
New York	4.00%	40	4.49%	8.49%	9	4.875%
North Carolina	4.75%	36	2.15%	6.90%	24	2.75%
North Dakota	5.00%	33	1.78%	6.78%	29	3.50%
Ohio	5.75%	27	1.39%	7.14%	19	2.25%
Oklahoma	4.50%	37	4.36%	8.86%	6	6.50%
Oregon	0.00%	46	0.00%	0.00%	47	0.00%
Pennsylvania	6.00%	16	0.34%	6.34%	33	2.00%
Rhode Island	7.00%	2	0.00%	7.00%	21	0.00%
South Carolina	6.00%	16	1.22%	7.22%	18	2.50%
South Dakota (c)	4.50%	37	1.89%	6.39%	31	4.50%
Tennessee	7.00%	2	2.46%	9.46%	2	2.75%
Texas	6.25%	13	1.94%	8.19%	12	2.00%
Utah (b)	5.95%	26	0.81%	6.76%	30	2.15%
Vermont	6.00%	16	0.18%	6.18%	36	1.00%
Virginia (b)	5.30%	31	0.33%	5.63%	41	0.70%
Washington	6.50%	9	2.42%	8.92%	5	3.40%
West Virginia	6.00%	16	0.29%	6.29%	34	1.00%
Wisconsin	5.00%	33	0.42%	5.42%	43	1.75%
Wyoming	4.00%	40	1.40%	5.40%	44	2.00%
D.C.	5.75%	(27)	0.00%	5.75%	(41)	0.00%

(a) City, county and municipal rates vary. These rates are weighted by population to compute an average local tax rate.
(b) Three states levy mandatory, statewide, local add-on sales taxes at the state level. California (1.25%), Utah (1.25%), Virginia (1%), we include these in their state sales tax.
(c) The sales taxes in Hawaii, New Mexico and South Dakota have broad bases that include many services
(d) Due to data limitations, table does not include sales taxes in local resort areas in Montana
(e) Salem County is not subject to the statewide sales tax rate and collects a local rate of 3.4375%. New Jersey's average local score is represented as a negative.
Sources: Sales Tax Clearinghouse, Tax Foundation calculations, State Revenue Department websites

The Role of Competition in Setting Sales Tax Rates

Avoidance of sales tax is most likely to occur in areas where there is a significant difference between two jurisdictions' sales tax rates. Research indicates that consumers can and do leave high-tax areas to make major purchases in low-tax areas, such as from cities to suburbs.[7] For example, evidence suggests that Chicago-area consumers make major purchases in surrounding suburbs or online to avoid Chicago's 10.25 percent sales tax rate.[8]

At the statewide level, businesses sometimes locate just outside the borders of high sales tax areas to avoid being subjected to their rates. A stark example of this occurs in New England, where even though I-91 runs up the Vermont side of the Connecticut River, many more retail establishments choose to locate on the New Hampshire side to avoid sales taxes. One study shows that per capita sales in border counties in sales tax-free New Hampshire have tripled since the late 1950s, while per capita sales in border counties in Vermont have remained stagnant.[9] The state of Delaware actually uses its highway welcome sign to remind motorists that Delaware is the "Home of Tax-Free Shopping."[10]

State and local governments should be cautious about raising rates too high relative to their neighbors because doing so will yield less revenue than expected or, in extreme cases, revenue losses despite the higher tax rate.

Sales Tax Bases: The Other Half of the Equation

This report ranks states based on tax rates and does not account for differences in tax bases (*e.g.*, the structure of sales taxes, defining what is taxable and nontaxable). States can vary greatly in this regard. For instance, most states exempt groceries from the sales tax, others tax groceries at a limited rate, and still others tax groceries at the same rate as all other products.[11] Some states exempt clothing or tax it at a reduced rate.[12]

Tax experts generally recommend that sales taxes apply to all final retail sales of goods and services but not intermediate business-to-business transactions in the production chain. These recommendations would result in a tax system that is not only broad-based but also "right-sized," applying once and only once to each product the market produces.[13] Despite agreement in theory, the application of most state sales taxes is far from this ideal.[14]

Hawaii has the broadest sales tax in the United States, but it taxes many products multiple times and, by one estimate, ultimately taxes 99.21 percent of the state's personal income.[15] This base is far wider than the national median, where the sales tax applies to 34.46 percent of personal income.[16]

Methodology

Sales Tax Clearinghouse publishes quarterly sales tax data at the state, county, and city levels by ZIP code. We weight these numbers according to Census 2010 population figures in an attempt to give a sense of the prevalence of sales tax rates in a particular state.

It is worth noting that population numbers are only published at the ZIP code level every 10 years by the U.S. Census Bureau, and that editions of this calculation published before July 1, 2011, do not utilize ZIP code data and are thus not strictly comparable.

It should also be noted that while the Census Bureau reports population data using a five-digit identifier that looks much like a ZIP code, this is actually what is called a ZIP Code Tabulation Area (ZCTA), which attempts to create a geographical area associated with a given ZIP code. This is done because a surprisingly large number of ZIP codes do not actually have any residents. For example, the National Press Building in Washington, D.C., has its own ZIP code solely for postal reasons.

For our purposes, ZIP codes that do not have a corresponding ZCTA population figure are omitted from calculations. These omissions result in some amount of inexactitude but overall do not have a palpable effect on resultant averages because proximate ZIP code areas which do have ZCTA population numbers capture the tax rate of those jurisdictions.

Conclusion

Sales taxes are just one part of an overall tax structure and should be considered in context. For example, Washington state has high sales taxes but no income tax, whereas Oregon has no sales tax but high income taxes. While many factors influence business location and investment decisions, sales taxes are something within policymakers' control that can have immediate impacts.

[1] Due to data limitations, this study does not include local sales taxes in resort areas in Montana.

[2] This number includes a mandatory add-on tax which is collected by the state but distributed to local governments. Because of this, some sources will describe California's sales tax as 6.5 percent. A similar situation exists in Utah and Virginia.

[3] The sales taxes in Hawaii and South Dakota have bases that include many services and so are not strictly comparable to other sales taxes.

[4] Haleigh Pike, "California's Sales Tax Rate to Decrease in January 2017," KRCR News, Dec. 30, 2016, http://www.krcrtv.com/news/local/shasta/californias-sales-tax-rate-to-decrease-in-january-2017/238477141.

[5] Jared Walczak, "New Jersey's Gas Tax Increase is Just One Part of the Story," Tax Foundation Tax Policy Blog, Oct. 24, 2016, http://taxfoundation.org/blog/new-jerseys-gas-tax-increase-just-one-part-story.

[6] Ramona Giwargis, "Bay Area Cities Brace Themselves for Higher Sales Taxes, Despite State Decrease," *The* (San Jose) *Mercury News*, Dec. 30, 2016, http://www.mercurynews.com/2016/12/30/bay-area-cities-brace-themselves-for-higher-sales-tax-despite-state-decrease/.

[7] Mehmet Serkan Tosun and Mark Skidmore, "Cross-Border Shopping and the Sales Tax: A Reexamination of Food Purchases in West Virginia," Working Paper 2005-7, Regional Research Institute, West Virginia University. http://rri.wvu.edu/wp-content/uploads/2012/11/Tosunwp2005-7.pdf. *See also*, Randolph T. Beard, Paula A. Gant, and Richard P. Saba. "Border-Crossing Sales, Tax Avoidance, and State Tax Policies: An Application to Alcohol," *Southern Economic Journal* 64, No. 1 (1997): 293-306.

[8] Susan Chandler, "The sales tax sidestep," *Chicago Tribune*, July 20, 2008, http://articles.chicagotribune.com/2008-07-20/business/0807190001_1_sales-tax-tax-avoidance-tax-landscape.

[9] Art Woolf, "The Unintended Consequences of Public Policy Choices: The Connecticut River Valley Economy as a Case Study," Northern Economic Consulting, Nov. 2010, http://www.documentcloud.org/documents/603373-the-unintended-consequences-of-public-policy.html.

[10] Len Lazarick, "Raise taxes, and they'll move, constituents tell one delegate," Marylandreporter.com, Aug. 3, 2011, http://marylandreporter.com/2011/08/03/raise-taxes-and-theyll-move-constituents-tell-one-delegate/.

[11] For a list, *see* Jared Walczak, Scott Drenkard, and Joseph Henchman, *2016 State Business Tax Climate Index*, Tax Foundation, Nov. 17, 2015, http://taxfoundation.org/article/2016-state-business-tax-climate-index/.

[12] Liz Malm and Richard Borean, "How Does Your State Sales Tax See That Blue and Black (or White and Gold) Dress?" Tax Foundation, Feb. 27, 2015, http://taxfoundation.org/blog/how-does-your-state-sales-tax-see-blue-and-black-or-white-and-gold-dress.

[13] Justin Ross, "A Primer on State and Local Tax Policy: Trade-Offs Among Tax Instruments," Mercatus Center at George Mason University, Feb. 25, 2014, http://mercatus.org/publication/primer-state-and-local-tax-policy-trade-offs-among-tax-instruments.

[14] For a representative list, *see* Jared Walczak, Scott Drenkard, and Joseph Henchman, *2016 State Business Tax Climate Index*.

[15] John Mikesell, "The Disappearing Retail Sales Tax," *State Tax Notes* (Mar. 5, 2012): 777-791.

[16] *Id.*